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VOLUME 14

Q-R

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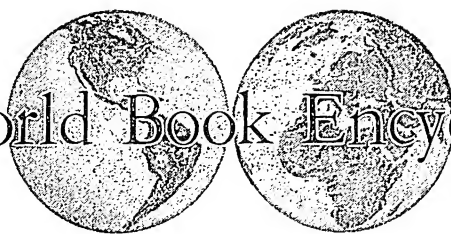
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The World Book Encyclopedia



VOLUME FOURTEEN

Qq

Q is the seventeenth letter of the English alphabet.

In the original Phoenician, from which the letter was derived, its name was *qoph*, which meant *head*, and in form it was a rude sketch of the back of the head and neck—nothing more than a circle with a short, vertical line running through it. It represented a somewhat different sound from the *kaph*, from which modern *k* is taken; but when the Greeks took over the alphabet, they had no sound for it, and it fell into disuse. The Romans, on the other hand, adopted it and made use of it in combination with *u*, as it is used in English today. In reality, it is an entirely superfluous letter in English, for its place could be filled by *kw* in all ordinary words, as *queen*, and by *k* alone in such occasional words from the French as *coquettish*. *Q* exists in English, therefore, solely because the Phoenicians had need of it to represent a sound distinct from *k*.



Q. E. D. See GEOMETRY (Terms Used).

Q. E. F. See GEOMETRY (Terms Used).

QOPH, the origin of the letter Q. See Q.

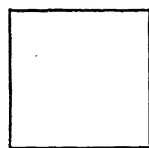
QUACK GRASS. See COUCH GRASS.

QUADRA, *kwod' rah*, a Spanish explorer. See VANCOUVER ISLAND.

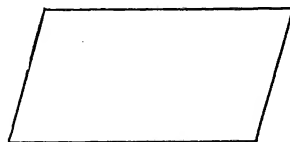
QUADRANT, *kwod' rant*, an instrument formerly used in navigation and in surveying for ascertaining the altitude of the sun. The name was given it because the instrument embodied an arc of 90°, or one-fourth of a circle. It has been almost entirely superseded by the sextant (which see).



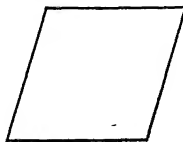
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QUADRILATERALS

(1) Rectangle. (2) Square. (3) Rhomboid. (4) Rhombus.

QUADRILATERAL, *kwod rih lat' ur al*, a plane figure having four straight sides. A

quadrilateral whose opposite sides are parallel is a parallelogram. Its opposite sides being parallel, it follows that they are equal, and that its opposite *angles* are equal. If the angles of a parallelogram are right angles, the figure is a *rectangle*; if the sides of a rectangle are equal, the figure is a *square*. When all the sides of a parallelogram are equal, the figure is a *rhombus*; when adjacent sides are unequal and the angles are oblique, the figure is a *rhomboid*.

A quadrilateral having one set of parallel sides is a *trapezoid*. If the other two sides are non-parallel and equal, the trapezoid is *isosceles*.

Trapezoid and Trapezium. Mathematicians do not agree on the meaning of these two terms. The foregoing definition is the one accepted generally in the United States today, while in England the quadrilateral having two parallel sides is called a *trapezium*. The terms are sometimes used interchangeably in the United States. Some writers define a trapezoid as "a quadrilateral having only one pair of sides parallel," but this is not the best modern practice.

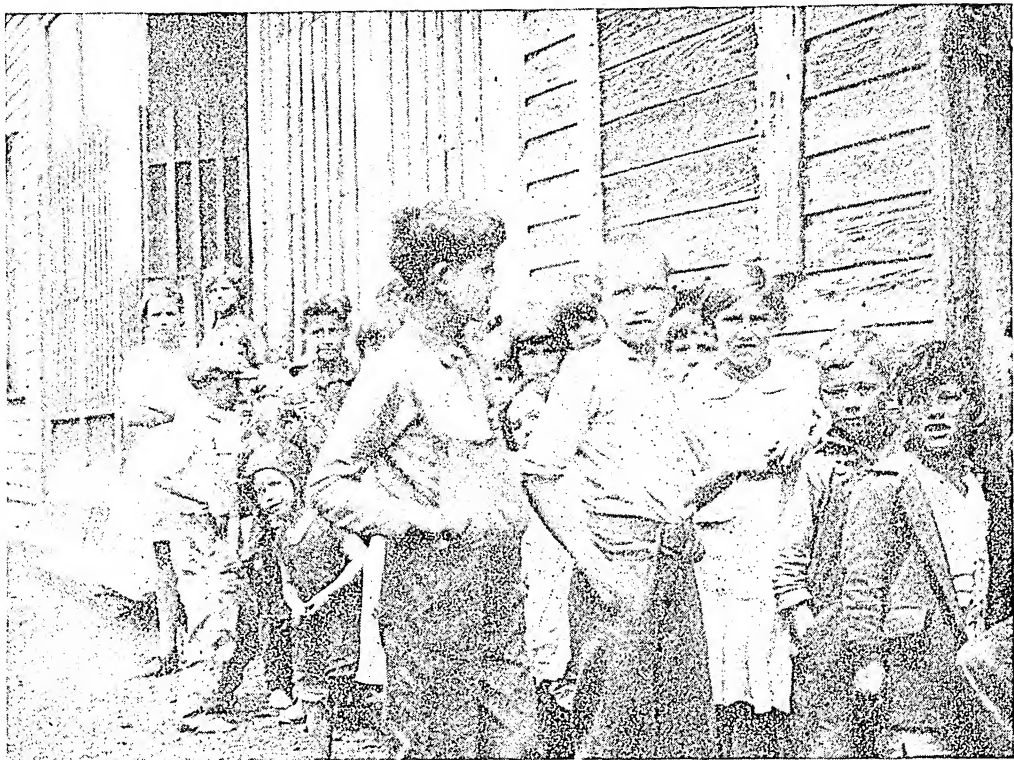
J.W.V.

Related Subjects. The reader is referred to:
Mensuration Rhombus
Rectangle Square

QUADRILLE, *kwah dril'*. See DANCING (Modern Dances).

QUADROON, *kwod roon'*. See MULATTO.

QUADRUPLEX TELEGRAPH. See TELEGRAPH.



Child Relief Work. Two views showing relief work among children of the bituminous coal fields, as carried on by the Quakers, or Society of Friends (see **QUAKERS**), through the American Friends Service Committee. Above, children of unemployed miners in Bell County, Ky., waiting for food; below, children drinking milk furnished by a relief center.

QUAESTOR, *kwes' tor*, an ancient Roman magistrate. When authentic history began in Rome, the consuls were the executive officers of the republic, and as such had charge of criminal and financial matters. The quaestors soon appeared as assistants to the consuls, and were at first probably appointed by them to act as their representatives in some matters; they always stood in special relations to the consul. At first, their functions seem to have been mainly concerned with criminal matters, in which they were judges or presidents of trial courts, but later, and under the empire, their duties were mainly of a financial nature, for they served as state treasurers. Their number at first, like the consuls, was two; under the empire they increased to twenty, as necessities of state required. See CON-SUL.

QUAHOG, *kwah' hog*. See CLAM.

QUAI d'ORSAY, *ka daw' sa'*, the name given to the Foreign Office of the republic of France. It is the office of the Minister of Foreign Affairs.

QUAIL. In the Old World, this name is applied to various species of game birds belonging to the pheasant family. In North America, it is used for several birds of the grouse family, of which the best-known is the bird called *bobwhite* and *quail* in the Northern and Eastern United States, *quail* in Canada, and *partridge* in the South. See GROUSE; PAR-TRIDGE.

The bobwhite, so-called from its clear, whistling notes (*ah bob-white*, with the last syllable sharply accented), is the only species of quail native to the section east of the Mississippi River, its ordinary range extending from the Gulf states to Southern Ontario. It is a plump bird, ten inches in length, and has reddish-brown plumage, with markings of black, white, and buff, aptly described as a

"speckled jacket." The bobwhite is a bird of the grasses rather than the trees, and its nest is always found on the ground. There are ten to eighteen or more white eggs in a brood. Weed seeds comprise half the food of this quail, and the remainder consists of grain (from the stubble), wild fruits, and insects. It devours such pests as chinch bugs, grasshoppers, the cotton-boll weevil, army worms, and cutworms, thus proving itself a true friend of the farmer. The

flesh of the bobwhite is a popular table food, and so many of the birds have been killed by hunters that many states have adopted laws for their protection.

Other species of American quail are the *California*, *Gambel's*, *mountain*, *blue*, and *Mearn's*. The mountain is the largest, and the Mearn's the smallest. All have noticeable crests and beautiful plumage, slate-blue, olive-brown, and black and white being prom-

inent colors. They are found in the Western and the Southwestern states.

The European quail is a migratory bird. American quails are not migratory, and as they are ground-feeders, they often suffer in the Northern States during severe winters. D.L.

Scientific Names. Old World quails belong to the family *Phasianidae*. North American quails are placed in *Tetraonidae*. The bobwhite is *Colinus virginianus*. The California and Gambel's quails belong to the genus *Lophortyx*; the mountain to *Oreortyx*; the blue to *Callipepla*; the Mearn's to *Cyrtonyx*.

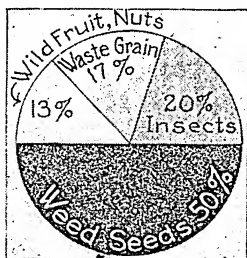
QUAKER POET. See WHITTIER, JOHN GREENLEAF.

QUAKERS, OR SOCIETY OF FRIENDS, a Christian sect founded in England about 1648, by George Fox (which see). The members of this body have preferred to be known as Friends; the name Quaker, bestowed in derision, originated in Fox's exhortation to the magistrates to "tremble at the name of the Lord." Notwithstanding severe persecution, both in the British Isles and in America, where the Quaker movement took root in 1656, the Society of Friends spread rapidly. Pennsylvania Colony was founded by a famous Quaker, the good William Penn (which see),



Photo: Visual Education Service

A FLOCK OF QUAIL, OR BOBWHITES



FOOD OF THE QUAIL

and the denomination exercised considerable influence in colonial days in several of the other middle colonies. A Quaker became President of the United States when Herbert Hoover was inaugurated, in 1929.

In the United States, a division occurred in the ranks of the Friends in 1827, when Elias Hicks attempted to rationalize the doctrine of the "Inner Light"; and advanced other views deemed unorthodox. The sympathizers

of non-resistance has at times subjected them to injustice and persecution. In general, the Quakers have exercised a beneficial influence wherever they have settled. E.R.

QUAKING ASPEN. See ASPEN.

QUALITATIVE ANALYSIS. See ANALYSIS.

QUANTA. See QUANTUM THEORY.

QUANTITATIVE ANALYSIS. See ANALYSIS.

QUANTITY. When anything has size, weight, number, mass, or volume which may be measured, increased, or diminished, it has quantity. The term may also mean a certain or considerable amount, as in the sentences:

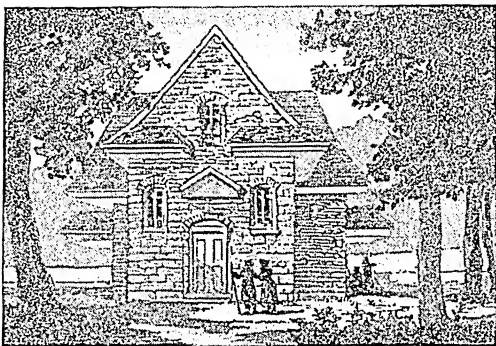
(1) Quantities of these shells are found on the shore.

(2) He bought a quantity of rubber in South America.

In mathematics, numbers are numerical quantities (see NEGATIVE QUANTITY; also, ALGEBRA). In prosody, quantity signifies the relative length of time occupied in pronouncing a syllable; in music, the quantity of the note denotes the relative length of time it is held. J.W.V.

QUANTUM THEORY, a theory proposed originally in 1901 by the German physicist Max Planck (1858-), which is based on the supposition that energy is discontinuous. According to Planck's hypothesis, when a body radiates or absorbs energy, the vibrating atoms or electrons lose or gain energy in sudden jumps, and the energy is emitted or absorbed in discrete units called *quanta*. Planck was led to this conception in the effort to solve a perplexing difficulty in regard to the distribution of energy in the spectra of bodies emitting heat. In the long wave-lengths, there was a difference between theory and experiment that could not be overcome when referred to the classical theory, which assumes that bodies emit and absorb energy continuously, by imperceptible degrees. Though he originally applied the new theory to the constitution of heat radiation alone, in 1912 Planck made it include all kinds of radiation, limiting it, however, to the emission of energy. Most authorities to-day regard it as applicable both to emission and absorption.

According to the classical theory, a vibrating system may contain any amount of energy. In the quantum theory, the contained energy of a radiating body is an equal multiple of the quantum peculiar to that body. The quanta are not the same for all radiators, because the value of the energy unit is always proportional to the frequency of the vibrations (number of oscillations per second). In all cases, there is a fundamental quantity called *Planck's constant*. Multiplying this constant by the frequency of the oscillating body gives the value of the quantum in ergs. Mathematically,



FIRST QUAKER MEETINGHOUSE

The illustration, drawn from an old engraving, is that of the first house of worship of the Society of Friends in America.

with Hicks are known as Hicksite or Liberal Quakers, and the original body, as Orthodox. At the present time, there are in the United States about 90,000 members in the Orthodox branch, and about 16,500 in the Hicksite. (The Hicksites never officially adopted Hicks' theology.) Another group of separatists, the Wilburites, who differ on points of discipline and practice, number about 3,500. Recently great steps have been taken toward reunion. In Great Britain, Canada, Australia, and Ireland, the members of the Orthodox branch number 26,500.

Originally, the Quakers were set apart from other Christian sects by several marked peculiarities. They dressed with plainness, used the "thee" and "thou" forms in daily conversation, and conducted their religious services in accordance with their belief that no one should take part until he felt called upon to do so by the Holy Spirit. In many sections, however, these practices have been greatly modified or abandoned. There are other points from which they have not deviated. They believe only in a spiritual baptism and communion and practice no outward celebration of these sacraments. They allow women to preach. The central point of their teaching is the doctrine that the individual is personally directed by the Holy Spirit—the "Inner Light." They believe the taking and administering of oaths to be contrary to Christ's teaching, and they are equally opposed to war in any form. Their principle

these relationships are expressed as follows: $E=hv$, where h is Planck's constant and v is the vibration frequency. The numerical value of h is 6.56×10^{-27} .

As an example, take the frequency at which a heated body radiates the largest possible amount of energy in the infra-red region. This frequency is about 1.5×10^{14} . The corresponding quantum is therefore $6.56 \times 10^{-27} \times 1.5 \times 10^{14}$, or approximately one ten-millionth of a millionth of an erg. Energy emitted in units so minute seems continuous to the human mind, but it should be remembered that in science infinitesimal size of units does not deny their separateness. The concept of discontinuous energy is in keeping with the discontinuity of matter and electricity, which has passed from theory to provable fact.

The quantum theory has been applied with notable success to the photo-electric effect, which concerns the property possessed by certain bodies, especially metals, of emitting electrons when subjected to the action of light. Its greatest triumph, however, has been its application to the structure of the atom, an achievement of the Danish physicist, Niels Bohr. According to the generally accepted theory, the atom consists of a central nucleus, about which revolve electrons in orbits similar to those followed by the planets in their journeys around the sun. Dr. Bohr regards each of the planetary electrons as revolving in a fixed orbit, or *quantum path*, and as moving in that orbit with an invariable speed. During its rotation about the nucleus, the electron does not radiate energy, but it may be excited to move from its orbit to an inner one, or may be "kicked" entirely outside the orbital field, and start moving back. Whenever an electron moves from one orbit to another, it does so in definite jumps, and in the process it liberates a quantum of energy. This phase of the quantum theory has been worked out in great detail and has received confirmation from experiments with the spectroscope.

The classical theory of the propagation of light in transverse waves through a medium called the ether has not been reconciled with the quantum theory, and such reconciliation is one of the unsolved problems of modern physics.

H.S.E.

Related Subjects. In this connection, the following articles give supplementary information:

Atom	Light
Chemistry (subhead)	Matter
Electricity	Physics
Ether	Spectrum Analysis

QUAPAW, *kwah' paw*. See INDIANS, AMERICAN (Most Important Tribes).

QUARANTINE, *kwahr' an teen*, a term used to signify the isolation of persons, places, animals, and effects which carry, or are reasonably supposed to carry, danger of infection.

The period of quarantine depends on the particular disease to be guarded against. In an earlier day, the word applied only to the forty days during which ships suspected of carrying infection were held outside of ports and forbidden to land passengers or freight. The word is from the Latin *quadragesima*, meaning *forty*.

International Quarantine. At the present time, any ship entering port is quarantined; it is boarded by an inspecting officer of the government, who receives from the officer in command a statement as to the health of crew and passengers. Heavy penalties may be inflicted for false statements or for concealment of facts. According to the officer's report, the ship receives either a *clean bill* or a *foul bill*, and either proceeds to its wharf without delay, or is quarantined for the time specified in regulations for various diseases. If the ship has been detained by contagious disease, every part of the vessel, as well as the cargo, is disinfected before it can proceed to its wharf. The quarantine station is always established at some distance from the landing places. In the United States, the quarantine service is under control of the Public Health Service. The diseases against which the United States maintains quarantine are Asiatic cholera, yellow fever, smallpox, typhus fever, leprosy, plague, and anthrax.

A ship under quarantine flies a yellow flag by day, and at night a white light is displayed at the masthead. Vessels or owners of vessels acting as carriers are exempt from responsibility or liability for non-delivery or delayed delivery of cargoes, if such arise from quarantine.

Before World War I, quarantine stations were limited to maritime ports; by 1939, stations had been set up on the borders of Poland, Czechoslovakia, Rumania, Hungary, and the Baltic States, for observation of travelers from countries harboring contagious diseases.

Other Kinds of Quarantine. A state or province, a city, town, or village, a community, a single household, or a person may be subject to quarantine regulations. General government regulations provide for protection of a country as a whole; each smaller political division may take steps to defend itself individually against infectious diseases. The power vested in the authorities for quarantine purposes is practically, and within reason, unlimited, even overriding, when considered necessary, personal-property rights. An official who wilfully exceeds his duty or powers, however, may be held personally liable for loss or damage to life or property.

When an infectious disease such as infantile paralysis, measles, or scarlet fever invades a home, a placard is attached to the house in

some conspicuous position, to warn others of the presence of dangerous illness within. In some cases, persons in the home who have been exposed to the disease are not allowed to leave the house until after a specified period. Isolation of the patient and his nurse in one part of the house is necessary when others continue to reside there. Tradesmen who make deliveries do not enter the place, but leave their packages on the porch. Doctors and nurses are supposed to take special precautions in regard to disinfection, and such measures are very important when a doctor goes from house to house during an epidemic. These and similar regulations are rigorously enforced in all civilized communities, and have been very effective in reducing mortality and checking epidemics.

Quarantine of Plants and Animals. Numerous injurious insect pests have been introduced into the United States and Canada through the importation of diseased plants. In both countries, laws have been passed providing for the inspection of plants shipped from other countries, and giving proper authority to specified boards or commissions to prohibit the landing of any shipments known to carry infection. Farms, districts, and states and provinces may be placed under quarantine when it is necessary to check the spread of plant diseases or insect pests that have gained entrance (see, in this connection, CORN BORER). Among the imported insects that American agriculture is fighting are the Japanese beetle, the European corn borer, the Mediterranean fruit fly, and the gypsy and brown-tail moths.

Diseased livestock is also kept out of the country, or is quarantined in areas within the country, by legal authority. Both the United States and Canada have enacted legislation to prevent the spread of animal diseases by the application of quarantine measures. For a typical operation of such measures, see the article FOOT AND MOUTH DISEASE.

Related Subjects. In addition to the references given above, the reader is referred in these volumes to the following articles:

Bill of Health	Epidemic	Insect (with list)
Disease	Fumigation	Sanitary Science

QUARRY AND QUARRYING. A *quarry* and a *mine* differ in but two essentials. The former is an excavation in the earth, open to all observers, from which are taken large masses of rock of high merchantable quality, such as marble, granite, limestone, sandstone, and other like building stones. An ordinary mine, while it is an excavation, is not visible from the surface of the earth; the excavation is often over half a mile below the surface, and is reached by shafts sunk to the various levels, where workmen seek metals and minerals. Such is the legal aspect of the two terms.

The operations by which valuable rocks in

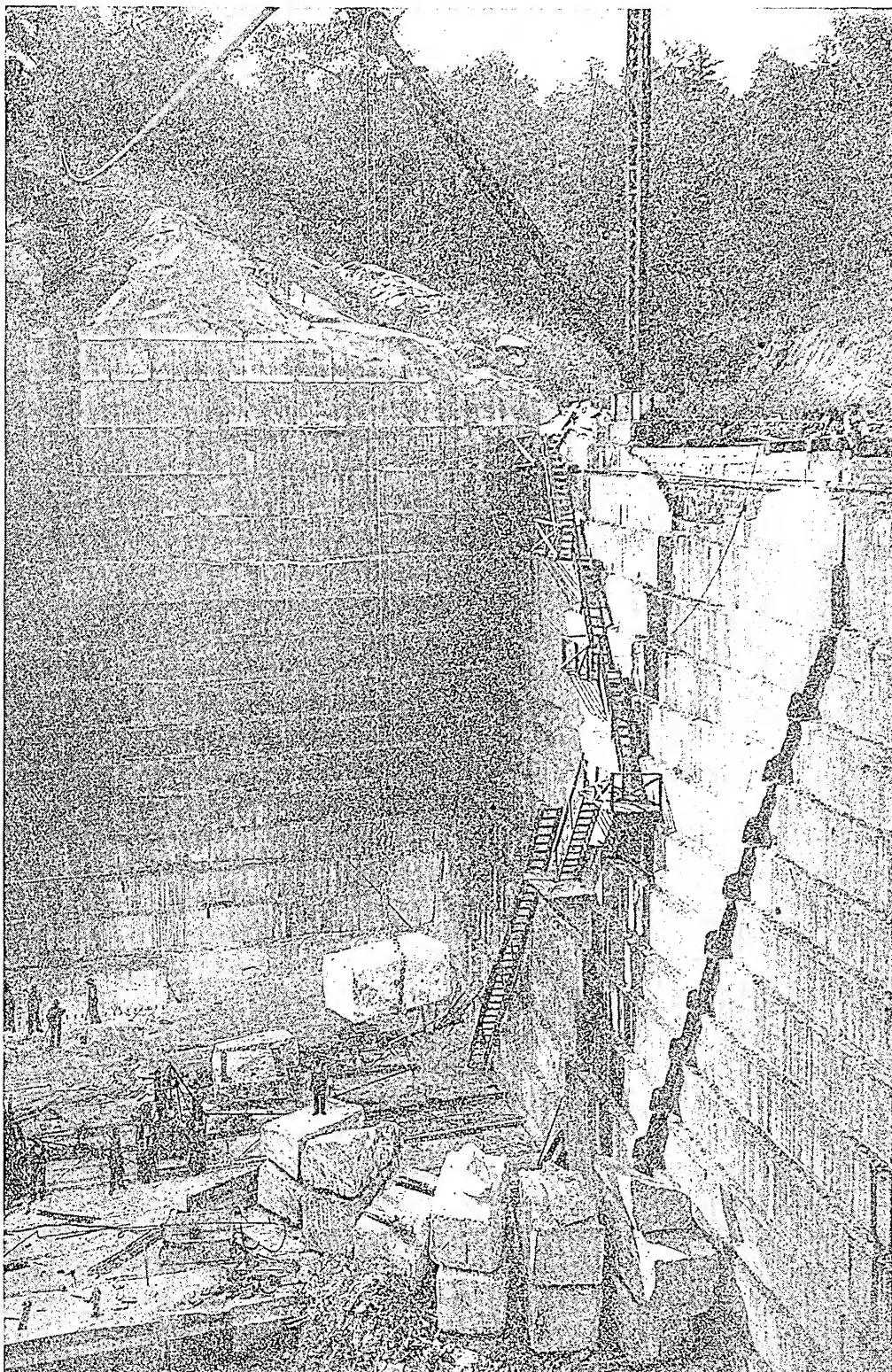
huge masses are taken from their natural locations and prepared for commercial purposes are known as *quarrying*. There are three processes which are employed in a quarry. One is known as the *plug and feather* method; another, the *explosive* method; the third, *channeling by machinery*.

Plug and Feather Method. Pressure, constantly increased and exerted uniformly, will split a mass of rock along a line of cleavage. By employing such means, workmen can break rock into such masses and into such shapes as suit their needs; the use of explosives, on the contrary, while sure to detach large masses, may destroy much valuable stone by breaking it into pieces too small for their intended use.

The principal tools in the plug and feather method are a wedge, or plug, flat on its two opposite surfaces, and two "feathers," pieces of steel, each rounded on one side and flat on the other. Into the rock, in a straight line at short intervals, holes about three-fourths of an inch in diameter are drilled. A plug is placed between two feathers, and these three pieces are inserted in a hole. When all the holes along the line where the rock is to be broken are thus filled, the workmen begin to drive the plugs and feathers downward. Each of the wedges thus formed is driven only a little way at a time, and thus the pressure is kept practically uniform; eventually, it is so great that the rock breaks.

The mass thus released is turned over to other workmen, who may in turn subject it further to the plug and feather process, or they may break it into smaller pieces by such hand tools as saws, drills, picks, hammers, and wedges. Still another class of artisans, more skilled and possessed of the artistic sense, work the smaller pieces into merchantable forms. When large pillars, columns, and the like are prepared, machinery is employed in rounding and polishing them.

Explosive Method. Usually, this is employed in detaching great masses of rock from their beds, and for this process, either dynamite or gunpowder, connected at a safe distance with a slow-burning fuse, is commonly used, the choice depending upon the results sought from the explosion. If finely broken pieces of stone are desired, and these are to be further crushed for road-making, for manufacturing concrete, and the like, dynamite acts powerfully. When stones of as large size as possible are sought, the milder explosive is employed. In either instance, drill holes are sunk deep into the solid mass of rock parallel to the exposed perpendicular face of the mass; into these the explosive is then poured, and electric wires are connected with each charge. The explosions resulting when the charges are fired are thus simultaneous, and sometimes hundreds of tons are thus forced out in a few very large pieces.



IN A GEORGIA MARBLE QUARRY

Photo: F. & L. Photo Service

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Channeling Machine. Most large quarries employ an ingenious device to make the first cuts into a solid bed of rock. This so-called channeling machine looks not unlike a miniature locomotive. Attached to its sides are sets of long, pointed chisels. The entire machine moves along a track on the smooth surface of the solid rock, and in its progress the chisels are forced downward. Little by little, they cut channels in the rock to any desired depth, even to one of ten feet; the width of the channel is a little more than an inch. Obviously, the channel cuts are vertical; the mass of rock must be completely detached from the solid part below by blasting, or by the plug and feather method, explained above.

Extent of the Industry. Of granite, limestone, marble, and sandstone quarries in the United States, it is not possible at any time to state the exact number; new quarries are frequently opened, and old ones are often abandoned. There are, on an average, about 1,925, divided among leading stones as follows:

Granite.....	384	Marble.....	50
Limestone.....	926	Sandstone.....	280

The principal producing states in each commodity are roughly as follows:

Granite. Those states possessing over thirty quarries are California, Connecticut, Georgia, Louisiana, Massachusetts, Minnesota, New Hampshire, North Carolina, Pennsylvania, Vermont.

Limestone. The states with over thirty quarries producing this popular building stone are Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Wisconsin.

Marble. There are marble quarries to the number of five or more in each of the following states: California, Georgia, Massachusetts, New York, Pennsylvania, Tennessee, Vermont.

Sandstone. The states with twenty or more sandstone quarries are California, Colorado, New York, Ohio, Pennsylvania, West Virginia, Wisconsin.

Related Subjects. The attention of the reader is called to the following articles in these volumes:

Building Stone	Granite	Marble
Explosives	Limestone	Sandstone

QUART, a measure of capacity used in the United States, Canada, and Great Britain for measuring both dry and liquid substances. (For tables, see DENOMINATE NUMBERS.) In the United States, the liquid quart is equal to one-fourth of a gallon, and to .9463 liter in the metric system, and contains 57.75 cubic inches; the dry quart is equal to one-thirty-second of a bushel and to 1.101 liter, and contains 67.2 cubic inches. Quarts in both measurements are divided into two pints. A vessel 4 x 4 x 3.6 inches will hold a liquid quart. The British imperial quart, both dry and liquid, contains 69.3185 cubic inches, or 1.136 liter. See, also, METRIC SYSTEM.

QUARTE. See FENCING.

QUARTER-DECK, that part of the upper deck of a boat lying between the stern and mainmast, which in men-of-war is reserved for the use of officers alone. It has consequently become a symbol of authority, and according to an old custom of the sea, it is saluted by all who step upon it, the officers present returning the salute. The forward part of the right side, or starboard, is reserved for the senior officer. A sailor who came to the quarter-deck with a complaint always stood near the mast at the forward end of the deck; thus he was said to "come to the mainmast"—an expression still heard among seamen, but the phrase is dying out.

QUARTERING ACT. See REVOLUTIONARY WAR (Causes).

QUARTER-SAWED OAK. See LUMBER.

QUARTO. See FOLIO.

QUARTZ, *kworts*, a compound of silicon and oxygen, is one of the most common of minerals. It is a constituent of many rocks, such as granite and gneiss, and is easily recognized in granite by its resemblance to broken glass. Most sandstones consist of small grains of quartz (sand) held together by some binder such as calcite or mica. Quartz is the hardest of the common minerals; only rare minerals, such as topaz, corundum, and diamond, are harder. It is highly resistant to weathering processes, and is insoluble in water and most acids.

There are many varieties of the mineral. It occurs in hexagonal crystals and also in massive form. Pure transparent quartz is called *rock crystal*, and is sometimes cut for gem purposes under the name of *Bristol diamond*. Varieties of transparent quartz colored by impurities include *amethyst*, which is violet; *false topaz*, pale yellow in tint; and *rose* and *smoky quartz*. Chalcedony, flint, and jasper are fine-grained forms of this valuable mineral.

Quartz has many uses. It is employed in making sandpaper, grindstone, and various other abrasives; quartz sands are extensively used in the manufacture of glass and mortar, and for many other purposes. Rock crystal is employed in making optical apparatus and devices. When fused, it can be used as a substitute for glass. A method of fusing has been devised which promises to make quantity production practicable. Fused quartz transmits the ultra-violet rays of light, which will not pass through ordinary glass, and it can transmit these rays around curves. It also has the property of expanding only in the slightest degree under intense heat. For these reasons, it is invaluable for lenses of microscopes, as a material for precision instruments, for making instruments to effect cures by transmitting ultra-violet rays, and for devices used in astronomy and photography. A.N.W.

Chemical Formula. Quartz is silicon dioxide, SiO_2 ; that is, a molecule contains one atom of silicon and two atoms of oxygen.

Related Subjects. The reader is referred in these volumes to the following articles:

Amethyst	Jasper
Chalcedony (with list)	Minerals
Flint	Sand
Granite	Sandstone

QUATERNARY, *kwa tur' na rie*, PERIOD, the second period of the Cenozoic Era and the latest period of geologic time, extending from the end of the Tertiary Period until and including the present time. The name, which means *fourth*, is a survival of an early classification in which the rocks now named Paleozoic were called *Primary*, and those now named Mesozoic were called *Secondary*. The period

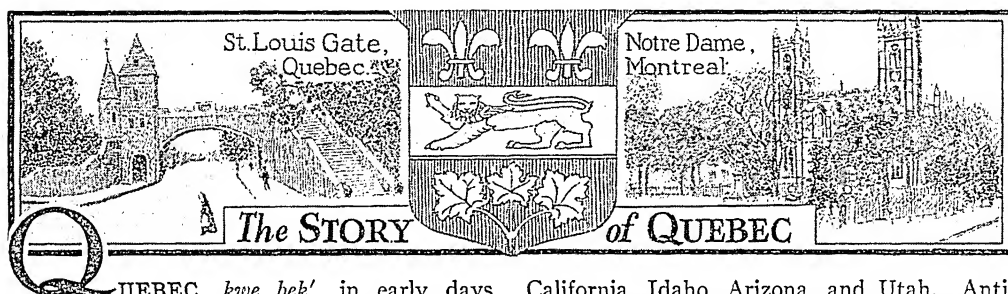
comprises two epochs—the Pleistocene, commonly called *Glacial*, and the Holocene, also called *Recent*, *Present*, or *Human Epoch*. The Quaternary Period is characterized by the appearance of the earliest known men upon the earth. For this reason, it has sometimes been called the *Age of Man*, and was formerly set off by some geologists in a separate era called the *Psychozoic*. L.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Cenozoic Era	Glacial Epoch
Geology (Divisions of Time)	Human Epoch
	Tertiary Period

QUATSINO SOUND. See VANCOUVER ISLAND.

QUAWK. See NIGHT HERON.



QUEBEC, *kwe bek'*, in early days known as LOWER CANADA, or CANADA EAST, is the oldest and the largest province of the Dominion of Canada, and the home of over two millions of people of French descent, who for more than a century and a half have preserved their language, their religion, their social customs, and their laws, making of themselves a nation within a nation.

Location and Extent. Quebec is bounded on the south by Ontario, a corner of New York, the Northern New England states, New Brunswick, and Chaleur Bay. It extends eastward to the Atlantic Ocean and northward to Hudson Strait, and the greater part of its western boundary is formed by Hudson and James bays, the remainder by Ontario. Labrador, belonging to Newfoundland, separates it from the ocean on the northeast. Its most easterly point is 500 miles farther east than Porto Rico, and its western boundary has practically the longitude of Buffalo, N. Y.

From 1912, when the province annexed the territory of Ungava, to 1927, Quebec had an area of 706,834 square miles. However, the settlement of the long-waged dispute over the Quebec-Labrador boundary, when made by the Privy Council of the Empire, in 1927, gave to Labrador 112,400 square miles of the disputed territory. Quebec's area is reduced, therefore, to 594,534 square miles. It covers an area nearly equal to that of six American states farthest west—Washington, Oregon,

California, Idaho, Arizona, and Utah. Anticosti and a number of other islands belong to the province.

The People. When Canada became a British possession, in 1763, there were about 70,000 French in the country. The British government wisely allowed these new subjects to retain their laws, religion, language, and social customs; these have been handed down from one generation to another practically without change, so that to-day we find in the French portion of Quebec a picture of the old Norman customs of a past age. This life is at its best in the great, fertile region bordering the Saint Lawrence River and extending eastward from Montreal.

French is the common language of the land; in many communities, English is seldom heard. In the part that is west of Montreal, and in the region lying between the Richelieu and Saint Lawrence rivers and the New England states, known as the Eastern Townships, the great majority of the inhabitants are of English and Scottish descent. The habits of life and social customs in this region closely resemble those of the Northern New England states. The region was originally settled by people from the English colonies who sided with England in the Revolutionary War. In general, the English people control the great financial enterprises of the province, but in numbers they are only thirteen per cent of the population of the province. The total population of Quebec

in 1931 was 2,874,255; in 1941 it was 3,331,882.

Religion. About ninety per cent of the people are communicants of the Roman Catholic Church. The Protestant denominations in order of their membership are the Anglican (Episcopal), Presbyterian, Methodist, and Lutheran. The Presbyterians and Methodists are now identified with the United Church of Canada.

Surface and Scenery. According to surface, Quebec is naturally divided into three regions—the plateau north of the Saint Lawrence, the long, level plain bordering the river on the south, and the region crossed by the Notre Dame Mountains and comprising the south-eastern counties.

The plateau north of the Saint Lawrence occupies by far the largest of these regions. On it the Laurentian Mountains rise here and there, but nowhere attain a high altitude. A height of land separating the rivers flowing

into the Saint Lawrence from those flowing into Hudson Bay crosses this plateau in an irregular line from east to west.

The lowland bordering on the Saint Lawrence is nearly level, but it is crossed by a number of isolated peaks extending from north to south, and known as the Monteregian Hills. The region crossed by the Notre Dame Mountains, which are a low extension of the Appalachian system, is rolling and hilly and in some places mountainous. The highest peak, Table Top Mountain, has an altitude of 4,000 feet.

Rivers and Lakes. Quebec is a land of lakes and rivers. The Saint Lawrence is the great gateway to the interior of the vast continent, and the main artery through which most of the rivers of the province find an outlet to the sea. The principal streams flowing into the Saint Lawrence from the north are the Ottawa, forming a part of the southern boundary, and which, not far from its mouth, receives the Gatineau; the Saint Maurice, noted for its volume of water and falls; and the Saguenay, with its magnificent scenery. On the south are the Richelieu, which drains Lake Champlain; the Chaudière, with its beautiful falls; and the Saint Francis, valuable for its water power.

The great region north of the height of land is drained into Hudson Bay and the Atlantic Ocean, and it is the portion which drains into the Atlantic that is now part of Labrador.



LOCATION MAP

The illustration shows the size of Quebec in comparison with the other provinces. For political map and map data of Quebec, see CANADA (map).

Most of the streams flowing into the Saint Lawrence from the north descend the plateau in a series of cascades, which add much to the beauty of the region.

Lake Megantic, north of Maine, is a favorite resort for fishermen. Lake Memphremagog, nestling among the hills with its southern end in Vermont, is visited by many tourists every season. Lake Saint John, about 100 miles north of Quebec, is a favorite resort easily reached by rail, or by steamer by way of the Saguenay. These are the best-known of the many lakes which lend their beauty to the Quebec landscape.

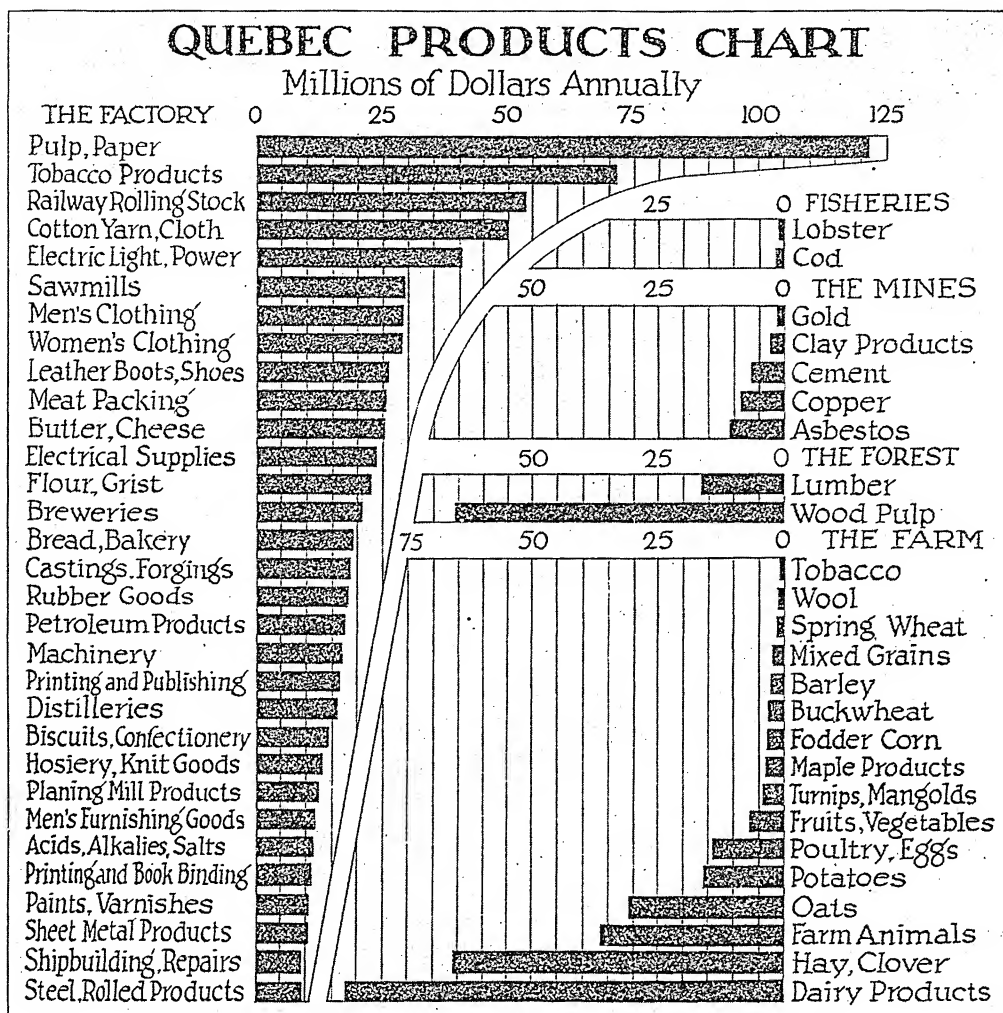
Climate. In the southern part of the province and along the Saint Lawrence, the summers are warm, with occasional hot days; and the winters are long and cold, with deep snows. Spring is short and autumn is pleasant. The northern part of the province has a cold climate, with long, severe winters and short, hot summers. Everywhere the rainfall is ample for agriculture. The atmosphere is clear and crisp, and the entire province has an invigorating and healthful climate. The dry air and absence of fogs make quite low temperatures bearable.

Plants and Animals. In the valleys of the Saint Lawrence and the Ottawa, and in the Eastern Townships, are forests of hard- and soft-wood trees. The oak, the ash, the maple, and the spruce and pine are here. The northern wild flowers, the hepatica, the claytonia, and the violet, adorn the fields and waysides in the spring, and the aster, goldenrod, and other favorites are abundant in late summer and early autumn. Nearly all the vast territory north of the Saint Lawrence is covered with forests of spruce, tamarack, and jack pine.

The moose, the caribou, the deer, the bear, and the lynx are the valuable large animals; while among the smaller animals are found the otter, the mink, the fox, the weasel, the muskrat, the skunk, and the beaver, all valuable for their fur. The hunter and trapper still range the forests, and Quebec's contribution to the world's production of fur is important. Stringent laws have recently been enacted by the Quebec parliament for preventing the extermination of the most valuable fur-bearing animals.

Thousands of waterfowl frequent the lakes to nest in summer, and all the birds found in a northern clime may be seen throughout the summer in the southern part of the province. The Canada goose is of especial importance.

Minerals and Mines. Until recent years, there has been little development of Quebec's mineral fields, but the development of a new copper mine at Noranda is putting the province among the leaders in mineral production. Quebec supplies about eighty per cent of the world's output of asbestos, the mines being located in the Eastern Townships, chiefly in Thetford and Danville. The yearly output



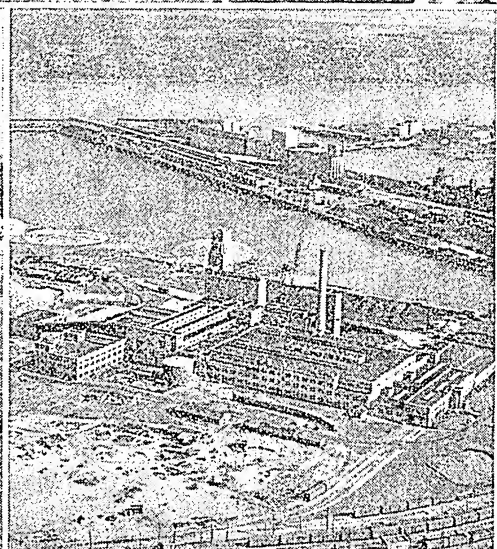
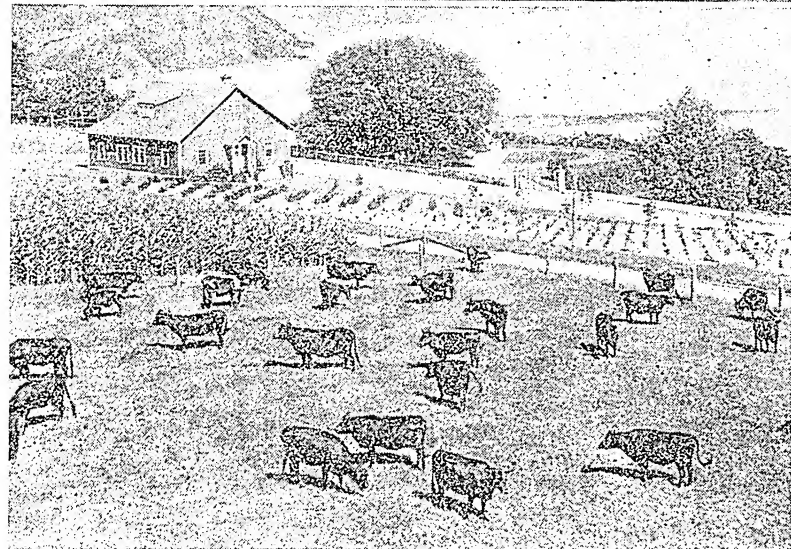
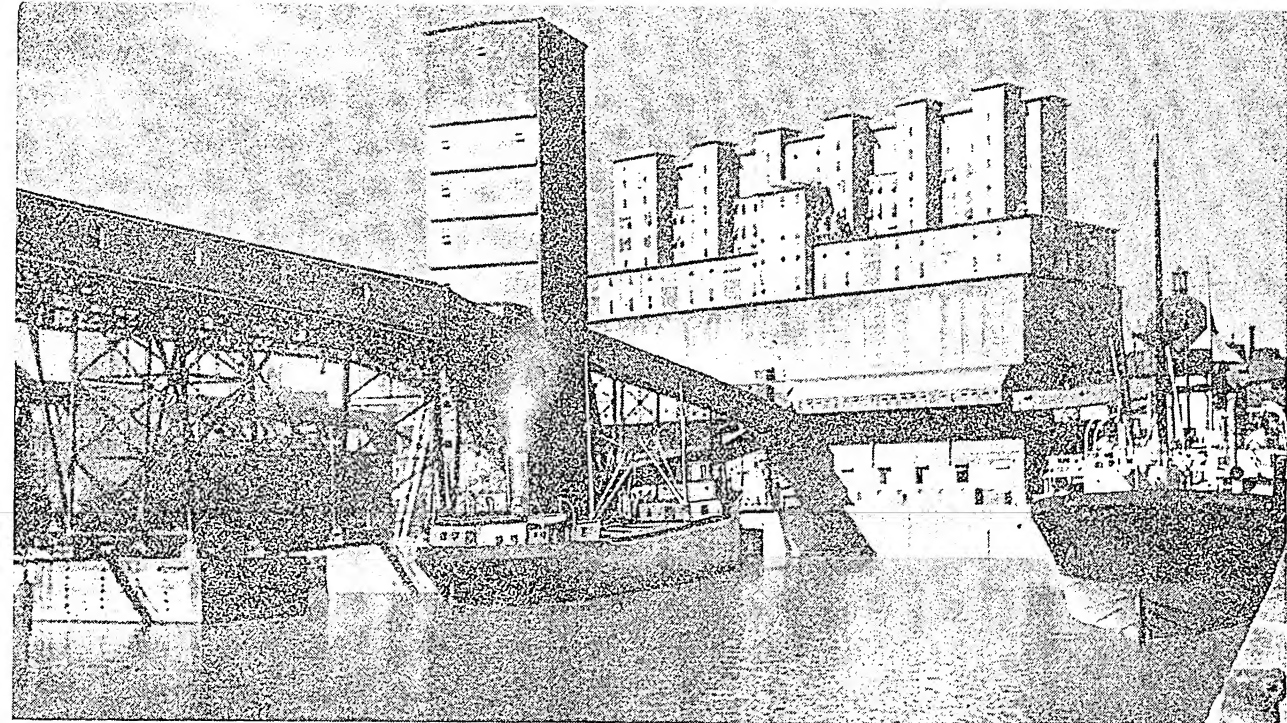
Figures are averages over a period of three years.

is valued at about \$15,850,000. The annual output of cement has a value of about \$6,500,000, and that of marble and limestone, over \$2,500,000. Some copper is mined in the Eastern Townships, and silver in paying quantities is obtained in the reduction of the ore. Gold and copper-bearing sulphides have been found in quantities in Western Quebec. Owing to the absence of coal, but little iron is mined. Graphite, minerals valuable for paints, phosphates, mica, manganese, and a number of other minerals exist, and the total yearly mineral production was valued at more than \$15,850,000. In the absence of coal, the extensive deposits of peat may be classed as a reserve mineral asset which will be developed. Already it is air-dried and used as a fuel.

Fisheries. Fishing is an important occupation for the people dwelling along the shores of the Gulf of Saint Lawrence. The total

annual value of the fisheries is about \$2,000,000. Cod, herring, and salmon, in the order named, yield the largest revenue. Lobsters and mackerel are also taken in large numbers.

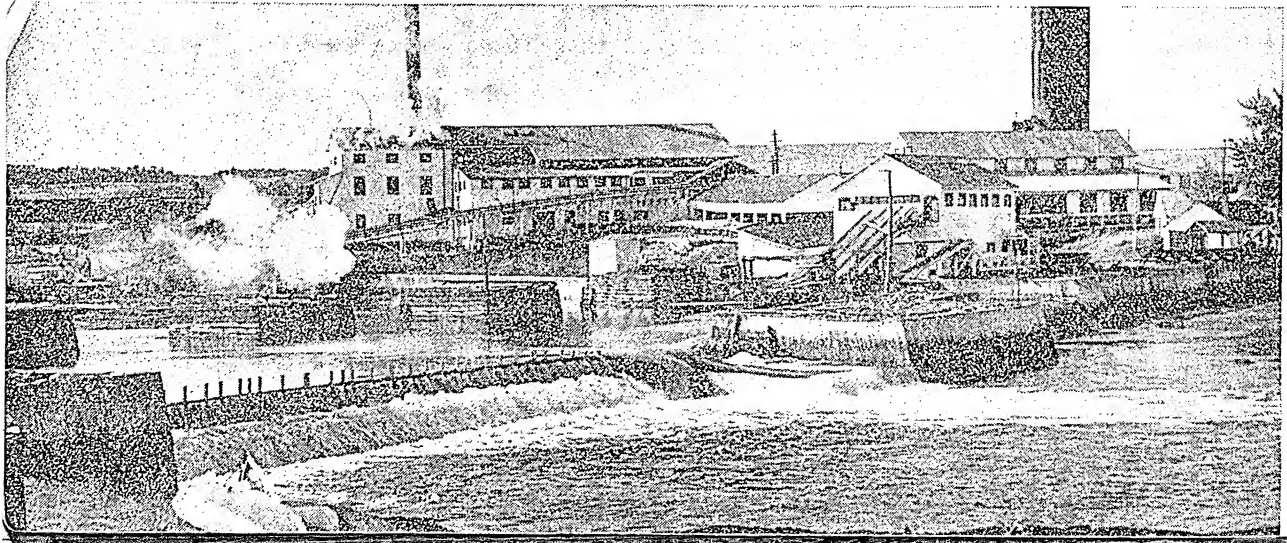
Forests and Lumber. The forest area of Quebec is not fully known, as the great forests of Ungava have been only partially surveyed. However, it is known that north of 57° latitude the country is barren and practically without trees. Exclusive of this unsurveyed portion, there are about 156,000,000 acres of forest standing, estimated to be worth \$600,000,000. The trees include white pine, spruce, balsam, hemlock, red pine, cedar, and tamarack, among the soft woods, and oak, beech, birch, and maple among the hard woods. Lumbering is one of the leading industries of the province, and is carried on chiefly around the sources of the Ottawa, the Gatineau, the Saint Maurice, and a few other streams north of

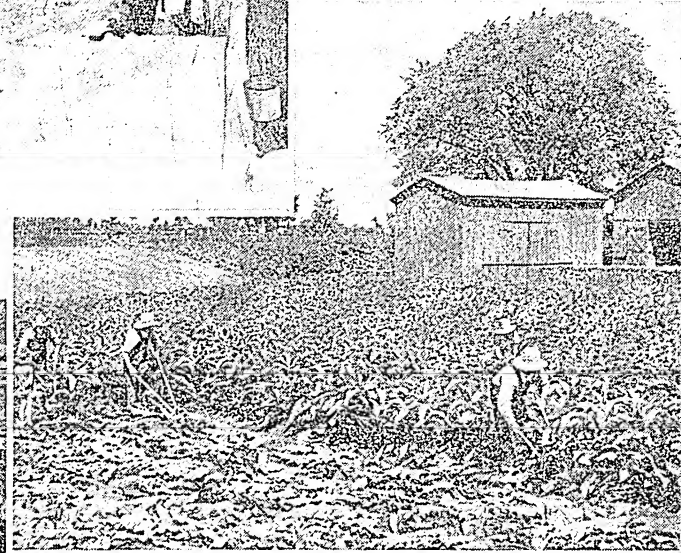
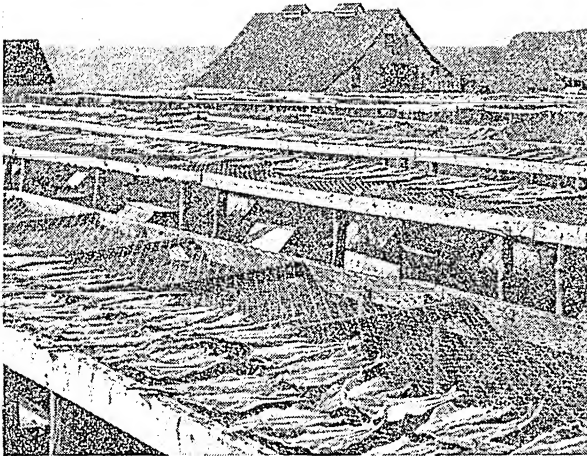
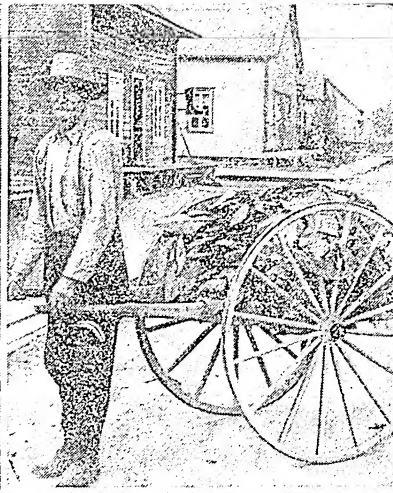


INDUSTRIAL ACTIVITIES

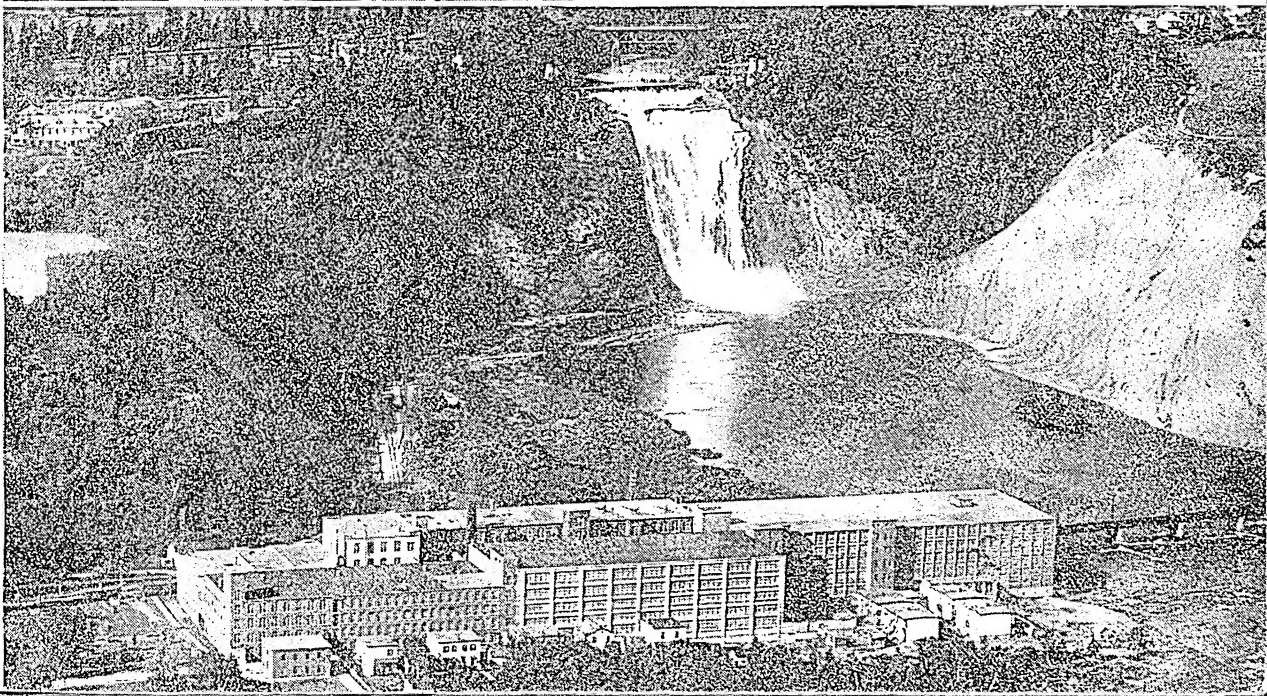
Top: Freighters loading grain from huge elevators in Montreal, one of the world's leading grain ports. Above left: Dairy cattle grazing along the St. Lawrence. Above right: Many mills in the city of Quebec convert lumber into pulp for making paper. Below: Lumber from the Shickshock Mountains of the Gaspé Peninsula is brought down to this mill on the Rimouski River in the eastern St. Lawrence Valley.

Photos: James Sawyers; Paul; L'Office du Tourisme, Quebec





Upper left: A late winter scene near St. Hilaire when the maple sap is running. Second right: Most Quebec farms grow and harvest a small tobacco crop. First right: A tobacco peddler at St. Henri de Tailon. Left: Drying codfish is an important industry at Percé on the Gaspé Peninsula. Below: Montmorency Falls, where electricity for the city of Quebec is generated.
 Photos: Canadian National Railways; James Sawders; Compagnie Aérienne Franco-Canadienne



the Saint Lawrence. The logs are cut in the winter and floated down the streams to the mills in the spring, when the water is high. Large lumber mills are found on all these rivers; but some of the timber is made into rafts that are towed long distances by steamers.

Spruce is cut in the largest quantities, since it is the most desirable wood for the manufacture of pulp. According to a provision of the Quebec government, all the pulpwood cut on the Crown lands in Canada must be manufactured into pulp. This provision has meant a practical subsidy to the pulp-and-paper manufacturing industry. The pulpwood exported to the United States is cut from the private forests. The value of this industry is estimated to be about \$89,000,000, and much of the product is sold in the United States. One half of the pulp production of Canada comes from Quebec.

Both the Dominion and the provincial government exercise close supervision of the forests, and the cutting of timber on all licensed lands is so restricted as to prevent destruction of the forests; stumpage dues are charged on all timber cut, provisions for the prevention of fire are required, and diameter limits protect immature trees. In addition, there is a comprehensive program for conservation, and large areas are set aside as forest reserves.

Agriculture is the leading occupation. Over one-half the occupied land is under cultivation, the cultivated area amounting to about 6,140,000 acres. This, however, is but a small part of the tillable land in the province. The region south of the Saint Lawrence is highly fertile, with the exception of small areas on the mountains, and the land is all occupied. The region north of the Ottawa and the island of Montreal are also excellent for agriculture. There are large areas of fertile land on the plateau north of the Saint Lawrence, but these areas are separated by tracts of rocky land unsuited to tillage.

The growing of crops, such as hay, grain, potatoes, etc., dairying, and livestock-raising are the main branches of agriculture, though fruit-farming is also important. About thirty-nine per cent of the value of field crops is represented by hay and clover, and twenty-three per cent by potatoes. Oats is the principal grain, followed by buckwheat, barley, spring wheat, and corn. Soil and climatic conditions for flax are favorable, and the opportunities for an excellent export trade are causing the government to encourage its cultivation.

Tobacco varieties suitable to the climate are grown in the regions on both sides of the Saint Lawrence from Berthier and Yamaska counties south to the United States border. The industry is at an early stage of development, and it is protected by a high duty on imported leaf. The maple-sugar production is an impor-

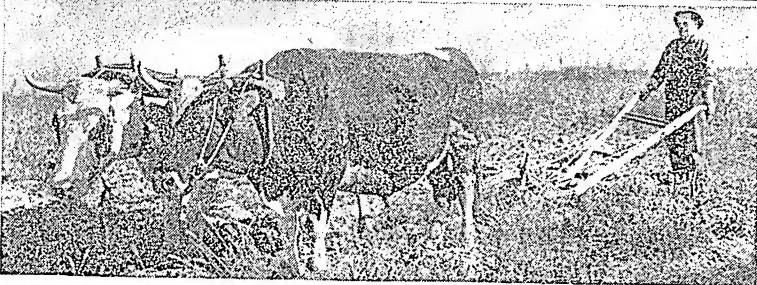
tant source of revenue to the people, though the yield has decreased in recent years with the introduction of synthetic syrup, and the higher profits realized when the maple is sold for the lumber. The annual yield averages \$3,000,000 in value, and the United States buys most of the maple sugar.

Fruit-growing is most extensive in the Eastern Townships, and in the Ottawa and Saint Lawrence valleys. Splendid qualities of apples are grown, though the acreage available for this crop far exceeds the area in cultivation. The Fameuse apples, of Canadian origin, are one of the most valuable of the crops. Quebec produces annually about 112,000 barrels of apples, as well as large quantities of pears, plums, and strawberries; and the Montreal muskmelons are famous for their delicious flavor. Bee-keeping and honey production in Quebec ranks next to Ontario, and this branch of agriculture receives considerable government aid. Livestock-raising, including the breeding of cattle, horses, sheep, and swine, is particularly suited to the climate of Quebec, and the dairy industry has been long established. Most of the butter is produced on the farms and is known as dairy butter; however, there are many creameries and cheese factories. The popularity of furs for both winter and summer wear has given fur farming great impetus; the most valuable animal thus bred is the silver fox.

The provincial and Dominion governments offer generous assistance to agriculture. There are farmers' societies and clubs through which the government dispenses financial aid for the purchase of better stock and seeds, and agricultural machinery for community use. Demonstration farms and expert farm advisers are within reach of all the farmers, and, in addition, there are three agricultural colleges. The economic condition of the Quebec farmer is almost without exception prosperous.

Manufactures. Quebec ranks next to Ontario in the value and variety of its manufactures, with more than 8,600 industrial establishments. Almost every stream is a source of water power, and the provincial government has reserved the water rights of most of the streams and lakes, leasing them to private companies. Quebec has a vast amount of power for hydroelectric plants, which is being steadily developed. Industries are attracted to Quebec because of the cheap and plentiful power and abundant labor supply. The forests offer the resources for the most important manufactures. The pulp-and-paper industry leads the list, with an invested capital of more than \$353,000,000, and the allied paper industries swell the sum by about \$40,000,000.

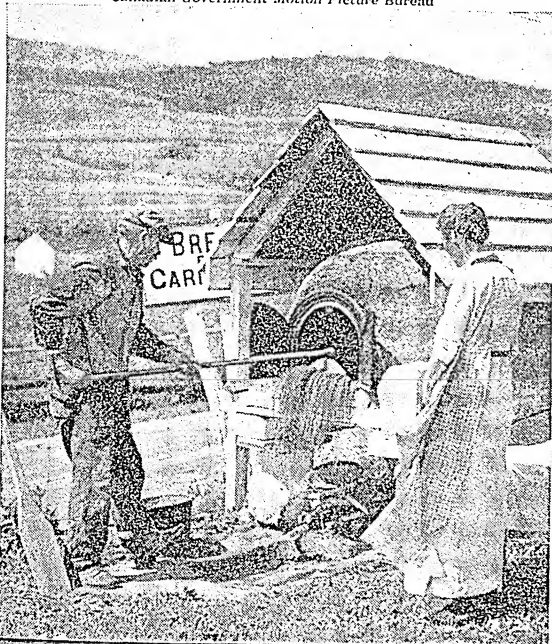
Quebec is the leading province in the manufacture of textiles, and leather and boot-and-shoe factories are located at Montreal, Quebec,

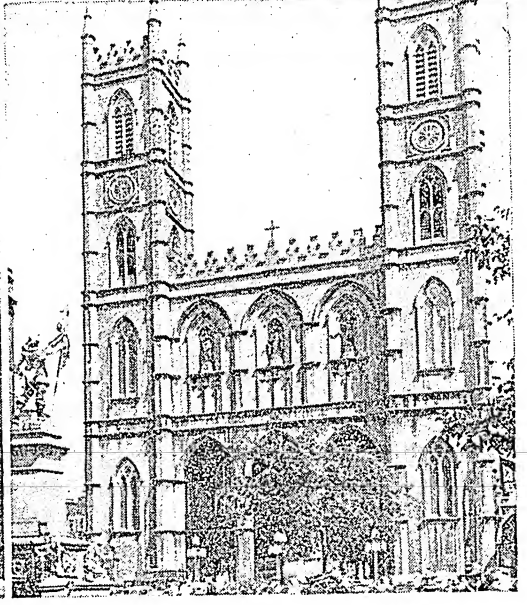
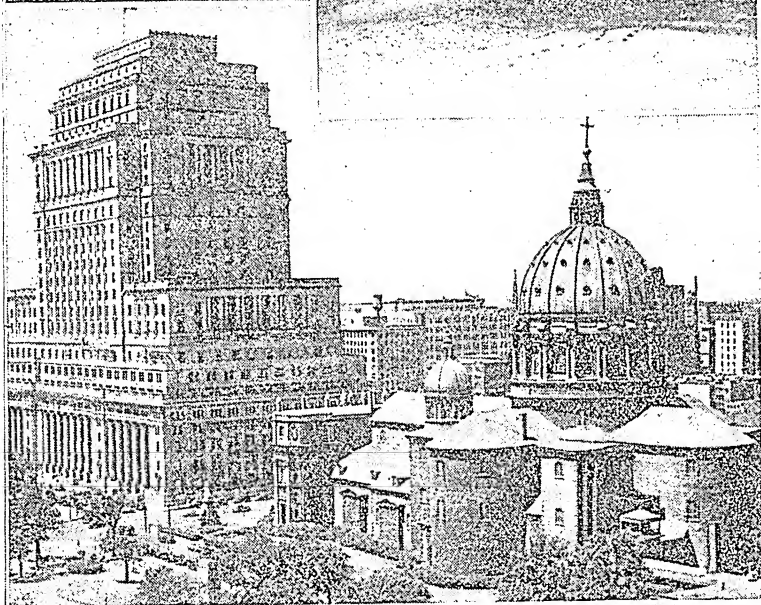
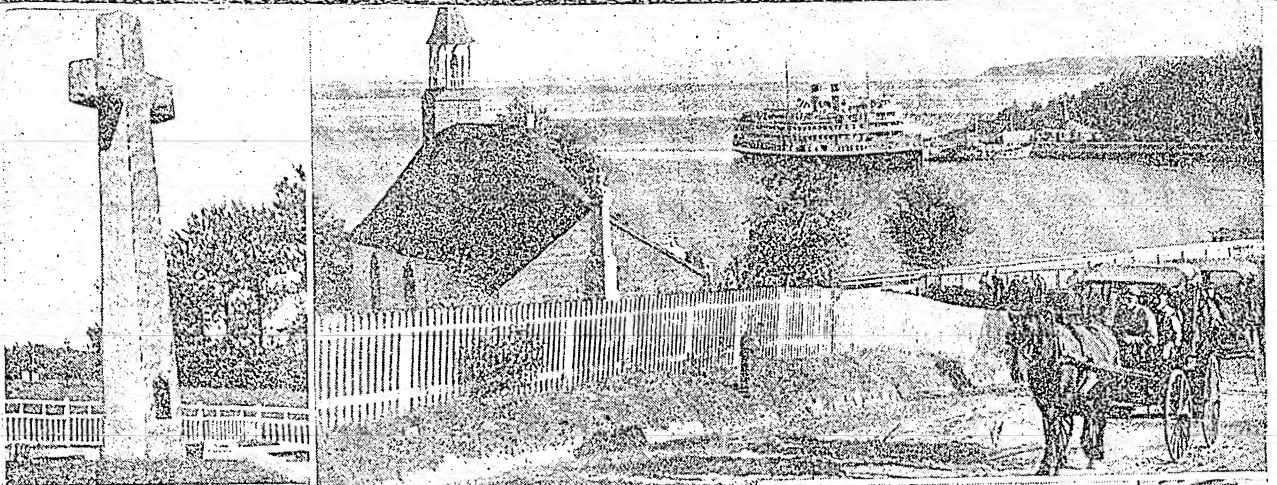


EVERYDAY LIFE IN PARTS OF RURAL QUEBEC

Nowhere in Canada is life more picturesque than it is in districts of rural Quebec where tradition and age-old customs remain strong. The art of carving wooden figures, handed down from generation to generation, is still practiced in the region between Levis and Rivière du Loup, *upper left*. The ox-drawn hay cart, *upper right*, the ox-drawn plow, *above*, and the dogcart, *lower right*, are still common on the Isle of Orleans. Making snowshoes, *right*, for the use of guides and trappers of the north woods is an important occupation of the Indian women at La Tuque. In many parts of Quebec, bread is baked in outdoor ovens, made partly of stones, like that shown *below*.

Photos: James Sawders; Phillip Gendreau: Canadian Pacific Railway; Paul; Canadian Government Motion Picture Bureau





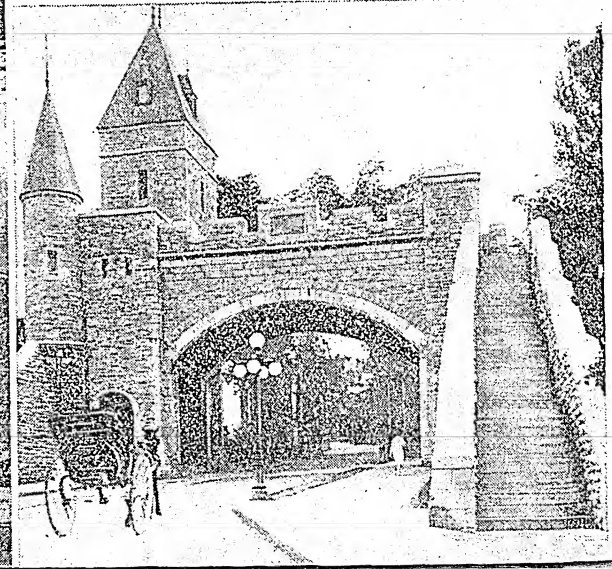
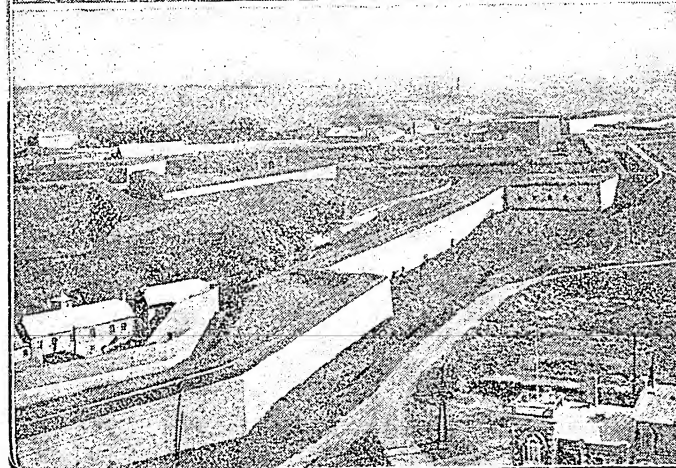
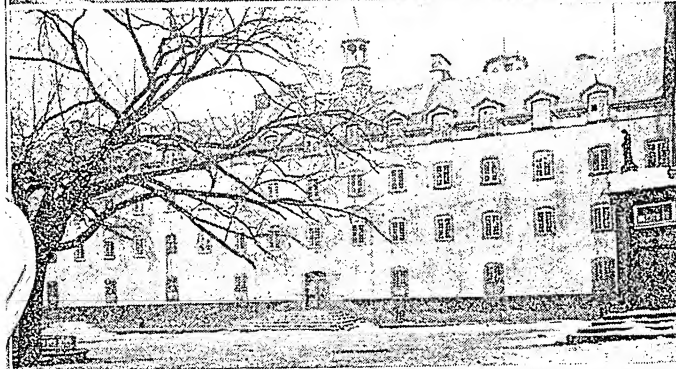
INTERESTING PLACES TO VISIT

Upper left: A granite cross marks the spot on the Gaspé Peninsula where the explorer, Jacques Cartier, claimed the land for France in 1534.

Upper right: A picturesque scene near Tadoussac on the St. Lawrence. *Second left:* Downtown Montreal, with St. James's Cathedral in the foreground.

Above: Church of Notre Dame, Montreal. *Left:* Quebec Seminary, forerunner of Laval University. *Lower left:* Quebec's historic citadel. *Below:* St. Louis Gate in Quebec.

Photos: James Sawders; Philip Gendreau; L'Office du Tourisme, Quebec; Canadian Pacific Railway



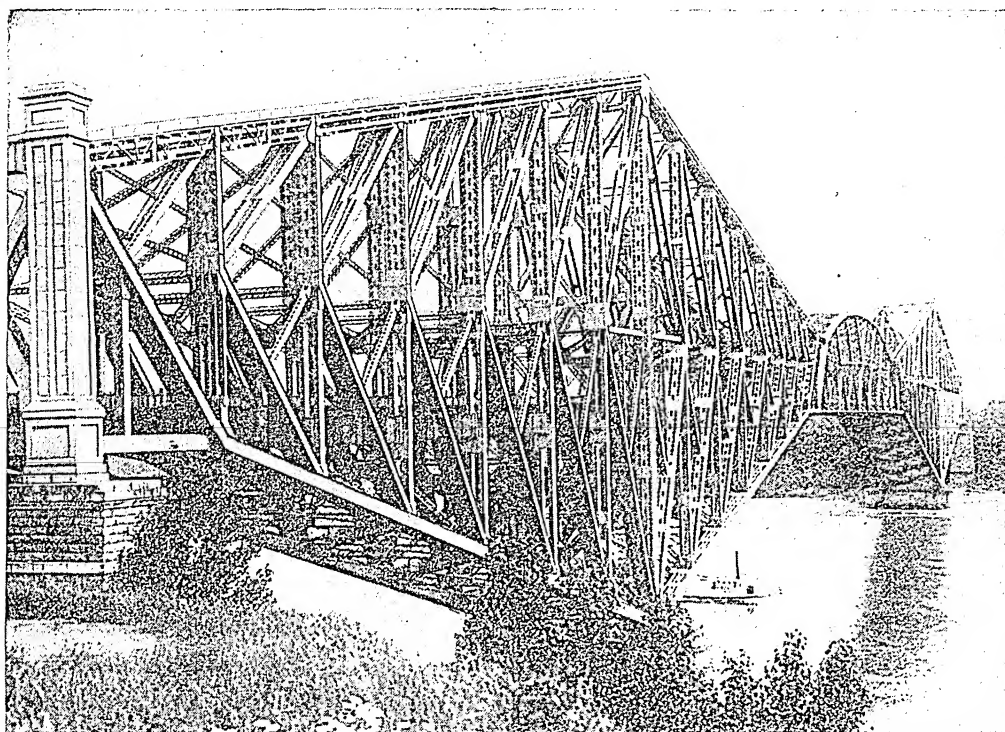


Photo: U & U

GREAT STEEL BRIDGE NEAR THE CITY OF QUEBEC

and Saint Hyacinthe. There are ironworks at Montreal, Three Rivers, and Sherbrooke. The leading factories for making cotton and woolen goods are at Montreal, Valleyfield, Saint Hyacinthe, and Sherbrooke. The annual value of the manufactures is about \$1,000,000,000. Many industries of the United States have branch factories in Quebec, as in other Canadian provinces, not only for the Canadian market, but also to take advantage of the preferential tariff to supply the foreign demand.

Transportation and Commerce. The Saint Lawrence River is navigable for ocean-going vessels as far as Montreal, and is the great commercial highway of the province. The Richelieu is obstructed by rapids at Chambly, but a canal at that point makes the river navigable for its entire length for boats of light draught. The Canadian Pacific and the Canadian National railways with their branches furnish ample railway accommodation to the region south of the Saint Lawrence and along the northern shore of that river. Branches of these lines are being extended northward as fast as the development of the new country seems to warrant. Telegraph and telephone lines are common throughout the settled regions. The movement for good roads in Quebec has resulted in developing one of the finest highway systems in Canada.

Montreal and Quebec are the leading commercial centers, and from the port of Montreal large quantities of wheat, grown in the Northwest provinces, are shipped to Europe. Montreal is, in fact, the greatest grain-exporting port on the continent. Other leading exports are lumber, wood pulp, butter and cheese, beef, and fruit. Most of the foreign trade is with Great Britain and the United States. The imports consist almost wholly of manufactured products, such as clothing, textiles, machinery, and hardware. The yearly exports amount to about \$341,000,000, and the imports to about \$105,000,000.

Education. The public schools are under the control of a superintendent of public instruction, who is assisted by a council of thirty-five members. This council is divided into two committees, one having the management of the Roman Catholic schools and the other that of the Protestant schools. All the schools are either Protestant or Catholic. The main support of the schools is local taxation. Owners of property pay their taxes into the Roman Catholic or Protestant or neutral panels, respectively. Public companies pay into the latter panel, which is divided between the other two on the basis of population. There are also government grants, divided on the same basis. Each school municipality is in the immediate care of its local board. The

QUESTIONS ON QUEBEC

(An Outline suitable for Quebec will be found with the article "Province.")

How does the highest altitude in Quebec compare with that in Ontario? In British Columbia? In Saskatchewan? In New York?

Why cannot definite statistics as to the forest area of this province be given?

If Texas had a forest area as large as the known forest area of Quebec, how many square miles of its surface would be unforested?

Why have voters a better chance to choose a good man to represent them in the legislature than have the voters of Illinois or New York?

What is the largest surface region of Quebec? What is the outstanding physical feature of this region?

How many of the fifty largest cities of Canada are in Quebec? (See table under article CITY.)

What proportion of the total area of Canada does this province comprise? How does the next largest province compare with it in area?

With what countries does Quebec carry on most of its foreign trade? Which are more valuable, the imports or the exports? How much?

How large a percentage of the inhabitants of the province speak English as their native tongue?

Where did the original inhabitants of the Eastern Townships come from?

Of what important mineral substance does the whole world outside of Quebec produce only about one-fourth as much as is produced in that province?

Why is very little iron mined?

Since Quebec has little coal, how do you account for the development of its manufactures?

Describe the farming region in the valley of the Saint Lawrence, stretching eastward from Montreal.

Name seven animals of this province which are important for their fur. Name four others in which the hunter is interested.

What, in general, is the economic condition of the Quebec farmer? How has the province helped in this?

How do you account for the fact that the French language spoken by the educated in Quebec has not lost its purity of form?

How many French-speaking people were there in Canada when it came into the possession of England?

How many are there to-day in this one province?

What were the official names of Quebec from 1791 to 1867?

What good effect did the War of 1812 have on affairs in Canada?

What lake is partly in this province and partly in one of the New England states?

How did the British, when they came into possession of Canada, secure the good will of the French population?

educational institutions are divided into four classes: (1) primary schools, which include elementary, intermediate, and complementary or high schools; (2) classical colleges; (3) universities (two Catholic, Laval and Mon-

treau; two Protestant, McGill and Bishop's College); (4) special schools including agricultural, domestic science, commercial, and arts and trades. In 1943, school attendance was made compulsory for all under fourteen.

Government and History

Government. The chief executive is a lieutenant governor, appointed by the Dominion government. He is assisted by a council of ministers, who are responsible to the legislative assembly. The head of the council, or premier,

is the executive head of the government. The legislature consists of two houses—a council of twenty-four members appointed for life, and an elective assembly of eighty-six members, elected for five years. Members are not

required to be residents of the district which they are chosen to represent, and this plan gives the voters a better opportunity to choose the best men. Quebec has sixty-five members in the Dominion House of Commons, and the number from each of the other provinces is regulated by this number, which was originally assigned to Quebec with the provision that it should remain unchanged [see CANADA (The Dominion Government)]. Twenty-four senators are sent to the Dominion Senate. Quebec was the last Canadian province to enfranchise women. This was done in April, 1940.

For purposes of local government, the province is divided into counties, townships, and municipalities, each having its special officers.

History. Until the conquest of Canada by Great Britain, 1759-1763, the history of Quebec was the history of New France. For a detailed account of this period see CANADA (History of Canada).

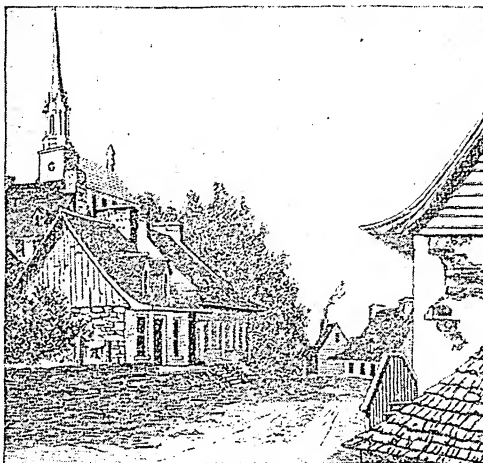
The Treaty of Paris (1763) ceded Canada to Great Britain. A radical change of administration followed. But the French civil laws and institutions were respected and free use of the French language was granted in the government and education. A strong opposition to the granting of these liberties, as guaranteed by the Treaty and *le droit des gens*, came from certain British bureaucrats and certain merchants, not from the governors and the military. When the Revolutionary War broke out, emissaries from the American colonies unsuccessfully tried to induce the Canadians to join with them in the struggle for independence. An expedition against Quebec, under Montgomery and Arnold (1775), was defeated, and Montgomery was slain. Another against Montreal failed. After the war, a large number of English and Scottish settlers entered Canada from the United States, and many settled in the Eastern Townships.

In 1791 the English settlers in the western part of Canada petitioned for a separate government, and the provinces of Upper Canada (Ontario) and Lower Canada (Quebec) were organized. In 1812 there was a growing antagonism between the English and French elements of the population, but the War of 1812-1814 between England and the United States served to unite these nationalities in support of the British government. For twenty years following the close of this war, government conditions in Canada were not satisfactory, and this led some of the French in Quebec to join in the Rebellion of 1837. This was headed in Upper Canada by William Lyon Mackenzie and in Lower Canada by Louis Papineau, who declared the purpose of the uprising to be to establish an independent Canadian nation.

At this time, about 1840, the population of Lower Canada was about 300,000, three-fourths of whom were French. In 1841 the provinces

were united under one government and a Canadian Parliament of two houses was established, and this arrangement continued until the formation of the Confederation in 1867, when Quebec became a province of the Dominion of Canada.

Since Quebec became a member of the Dominion, its record has been one of progress and prosperity. The energies of the government have been devoted to the development of the natural resources of the province, the advancement of education, and the conservation of the political rights of the people in the Dominion



A TYPICAL FRENCH VILLAGE

Such communities are found throughout the eastern part of the province.

government. During the century and a half of their existence under British rule, the French-Canadians have been insistent upon retaining their native language and all social customs. In 1917 Quebec made a futile protest against conscription, offering to withdraw from the Dominion. During World War I the women of Quebec gained the right to vote in Federal elections; during World War II they won (1940) that privilege in provincial elections.

Quebec has been unique in handling the prohibition question. The predominance of French population and the natural temperance of the people have caused them to resent arbitrary prohibition of a personal liberty. Quebec never enacted a prohibition law as did the other provinces, but there are government restrictions on the sale of liquor, wines, and beer. There are no bars. Liquor and wines are sold only at government stores. Beer is sold through grocers and at taverns, where a vote of the majority in the municipality demands it. Hotels may secure wines and beers, and purchases may be received by mail. M.H.

Related Subjects. The reader who is interested in Quebec will find much information in the following articles in these volumes:

CITIES AND TOWNS

Montreal Quebec

LEADING PRODUCTS AND INDUSTRIES

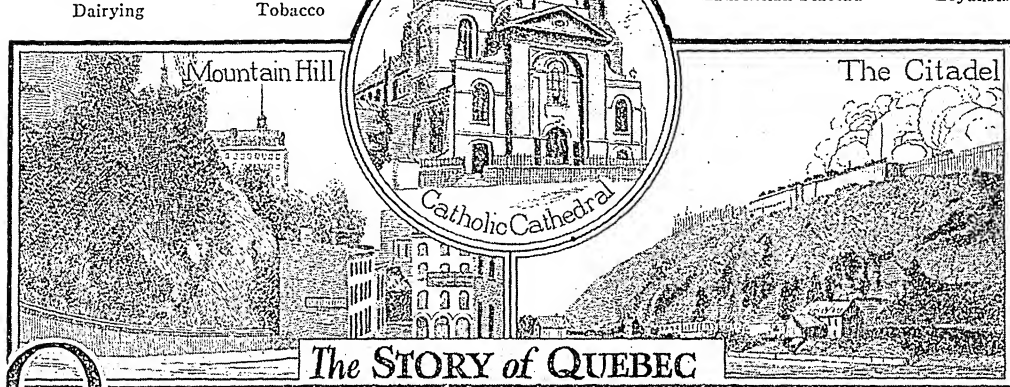
Apple	Fish
Asbestos	Hay
Butter	Herring
Cement	Lumber
Cheese	Oats
Cod	Paper
Dairying	Tobacco

WATERS

Chaudière	Richelieu River
Memphremagog	Saguenay
Ottawa	Saint Lawrence

UNCLASSIFIED

Anticosti	Labrador
Appalachian Mountains	Quebec Act
Laurentian Plateau	United Empire Loyalists



QUEBEC. With its fortress, battlements, castles, monasteries, and crooked streets, this capital of the Canadian province of Quebec has the charm of a medieval city of Europe. It is the only walled city in North America, and its popular titles—"Cradle of New France" and "Gibraltar of America"—suggest at once its unique history and its impressive site. Quebec is located 173 miles northeast of Montreal, on Cape Diamond, a bold promontory at the confluence of the Saint Lawrence and Saint Charles rivers. It is one of the military stations of Canada, and, with the exception of Gibraltar, once the strongest fortress in the British Empire. Among Canadian cities, it is sixth in size. Population 150,757 (1941). Nine tenths of the people are French and Roman Catholic.

General Description. When approached from the river side, Quebec seems a huge mass of rock and citadel. Details come out one after another—the firm lines of rampart and bastion, the shelving outlines of Cape Diamond, Dufferin Terrace, the houses huddled at the foot of the rock, and the quays and docks.

Perhaps the finest view is from the Citadel on the summit of Cape Diamond, 340 feet above the river. Looking down over the city, one sees a strange confusion of buildings tumbling down to the shores as though cast at random by some giant hand. The tin roofs sparkle and blaze in the reflected light on a sunny day. Cape Diamond presents a precipitous front to the Saint Lawrence, but gradually slopes to the Saint Charles. The distance between the rivers across the ridge is rather more than a mile. Opposite the Cape, the Saint Lawrence narrows to a breadth of

only 1,314 yards, but immediately below joins the gentle, meandering Saint Charles and forms an excellent harbor.

The Citadel. Fortifications enclose the Citadel, with its forty acres of parade ground. Canadian militia is stationed there in bomb-proof barracks loopholed for musketry. Powerful guns of modern construction command the land and water approaches to the city. The warlike aspects of this grim fortress are relieved by a tree-shaded esplanade, which joins two gates. Of the original six gates, three have been restored.

Upper Town. Around the Citadel is Upper Town, with the chief residences, public buildings, churches, gardens, and retail shops. The streets are broad, and street cars and automobiles are in evidence. Adjoining the Citadel, the famous Dufferin Terrace extends for about a quarter of a mile along the edge of the cliff.

Lower Town, built around the base of Cape Diamond on a narrow strip of rocky ground, has the narrow, cobblestone streets of a French provincial town. Lack of sidewalks makes walking precarious, but shrewd citizens overcame the difficulty by building covered bridges between the houses. Built of stone or brick, these houses of two or three stories have steep roofs and dormer windows. Lower Town is the commercial section of the city. Modern roadways have been constructed between Upper Town and Lower Town, but far more picturesque were the steep steps, such as the famous Break Neck Steps, of a bygone era.

Buildings, Monuments, and Parks. The buildings of the provincial parliament and departments of the government are the most important public structures. The grounds are

adorned with monuments and statues reared to the memory of the heroes of a former age—to Cartier, Frontenac, Laval, Maisonneuve, Wolfe, Montcalm, and Levis.

Among the more notable religious edifices in the province of Quebec are the Anglican and Roman Catholic cathedrals. In the close of the English Cathedral is the spot where Cartier first assembled his followers on their arrival in the colony. Though not outstanding architecturally, the Roman Catholic Notre Dame des Victoires is interesting for its associations. Begun in 1688, it was named in gratitude for the repulse, by the French, of Sir William Phips' attack on Quebec (1690). The tomb of Montcalm is in the chapel of the Ursuline Convent. The Hotel Dieu Convent and Hospital was founded in 1693. The historical palace of the French Intendants is in ruins, but the extent of the original can be traced.

Laval University, with its triple towers and shining cupola, is one of the glories of Quebec. This fine educational institution, with its art gallery and libraries, represents the best of French culture in the New World.

Directly back of Dufferin Terrace is the Governor's Garden, a place of beautiful lawns and flower plots. It is dominated by a tall granite monument erected by the inhabitants to the memory of Wolfe and Montcalm, and bearing this inscription in Latin:

Valor gave them a common death,
History a common fame,
And posterity a common monument.

East of the Terrace, and fronting on Place des Armes, is the picturesque Château Frontenac, one of the most complete modern hotels in America. It was built by the Canadian Pacific

Railway after the general architectural design of the old French château, and recently enlarged.

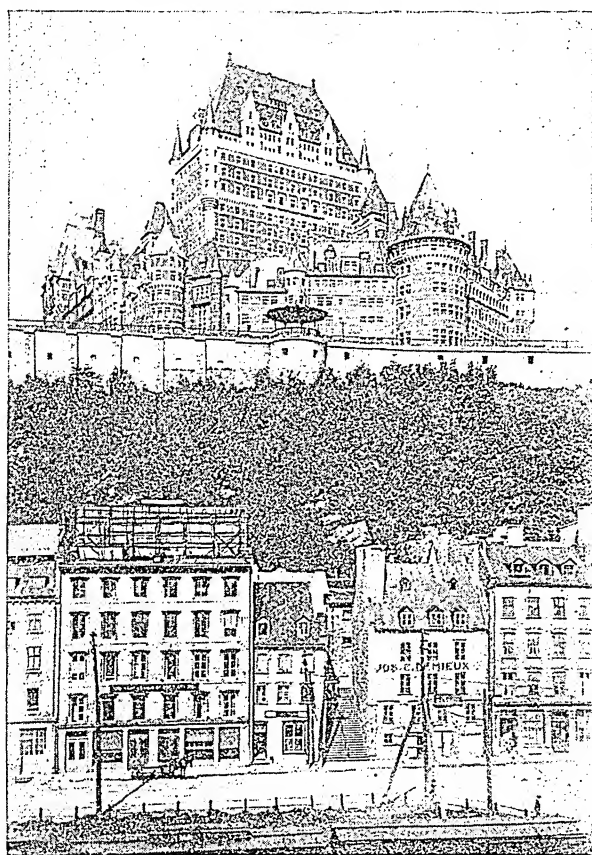
Commerce and Industry. Steamships unloading foreign cargoes and timid immigrants, or loading lumber; lake boats heavy with freight or crowded with tourists; and small passenger boats, used for sightseeing on the Saint Lawrence, line the wharves along the banks of both rivers during the summer months. Added to these are the ocean steamers that

enjoy eight months of business in carrying tourists to Europe from Montreal as a starting point. It is not surprising that the water front is a busy one, for in the Quebec harbor the largest vessels can float at all times. Although winter navigation is impracticable, with drift ice floating back and forth with the tide, the city has an enormous foreign trade. The chief export is lumber, which was formerly rafted into the coves of the Saint Lawrence, but is now carried by rail. There is also a large foreign trade in cattle and grain.

It was discovered in 1911 that Montreal had displaced Quebec in importance as a port. Immediately, the latter city

set about improving its commercial and industrial position by improving the harbor. One of the largest dry docks in the world was built here by the Dominion government at a cost of \$7,000,000.

Another important factor in increasing the city's commercial importance was the completion, in 1917, of the famous bridge connecting the north and south shores of the Saint Lawrence. One of man's greatest engineering feats, it has a total length of 3,239 feet and a suspended span of 640 feet. The completion of the bridge made possible the running of six railways simultaneously into Quebec—the



THE OLD AND THE NEW

Above, Château Frontenac; below, the old part of town, below the hills.

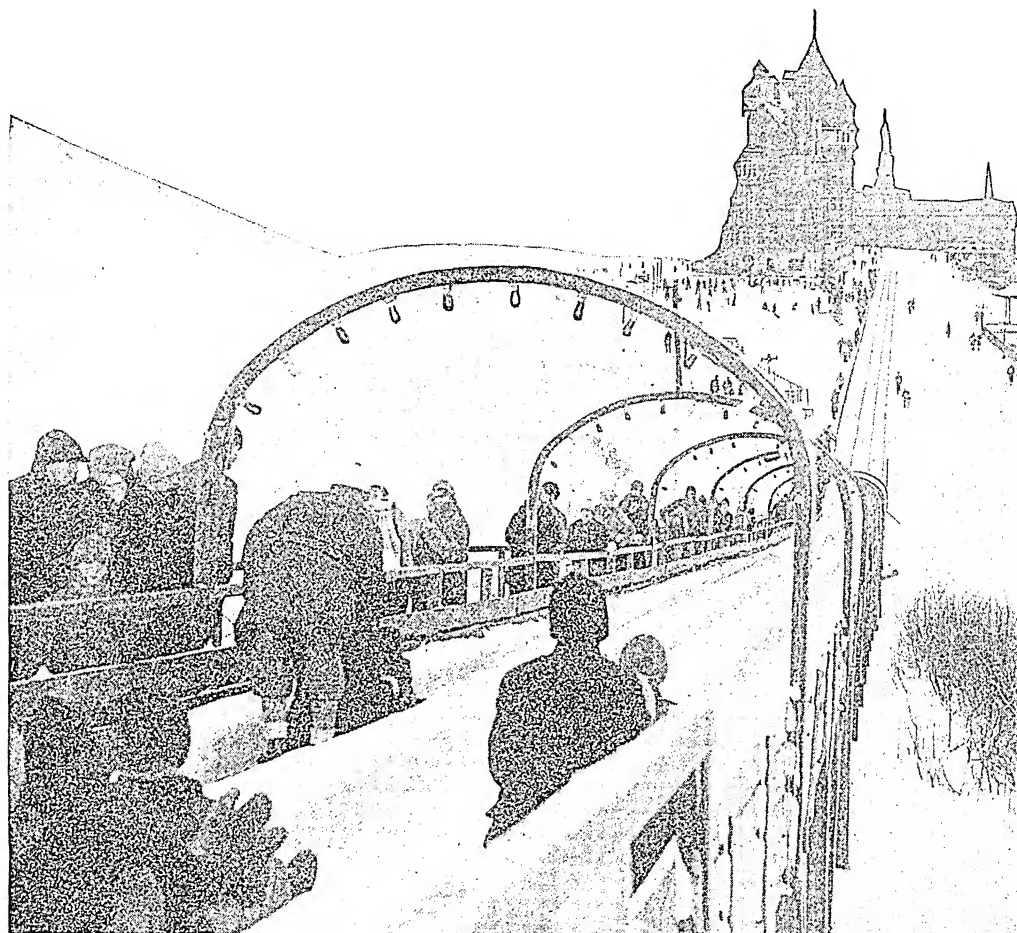


Photo: P & A

TOBOGANNING IN THE CITY OF QUEBEC

Canadian National and Canadian Pacific, and subsidiary lines. (See page 5911).

Industrial establishments include boot-and-shoe factories, tanneries, machine shops, steel and iron plants, printing and binding plants, and manufactories of wood pulp, food products, clothing, cigars, and cigarettes. Cheap electric power is supplied from the Shawinigan and Montmorency falls.

History. Jacques Cartier (which see) discovered the Indian village Stadacona, clustered about the foot of the bluff, when he sailed up the Saint Lawrence in 1535. Cartier erected a cross and took possession of the country for France.

In 1608, twelve years before the *Mayflower* touched the shores of Massachusetts, Samuel de Champlain (which see) founded a settlement, which he called Quebec. The English captured it in 1629, but it was restored to France in 1632. In 1663 it became the capital of the royal province of New France, which

Louis XIV dreamed of expanding into a French and Catholic empire that should embrace the entire continent.

The French held possession of Quebec until 1759, although two attempts were made by the English to capture it. Sir William Phips, governor of Massachusetts, with a fleet and army fitted out in New England, was defeated by Frontenac in 1690, and a British expedition under Sir Hovenden Walker was shipwrecked in the Saint Lawrence in 1711. On September 18, 1759, five days after the Battle of the Plains of Abraham (see QUEBEC, BATTLE OF), Quebec was captured by the British, and was later ceded to Great Britain by the Treaty of Paris (1763).

The Americans suffered a disastrous defeat when they attempted to capture the city in 1775. General Montgomery, leader of the American troops, was killed, and Benedict Arnold was compelled to retreat in the following spring.

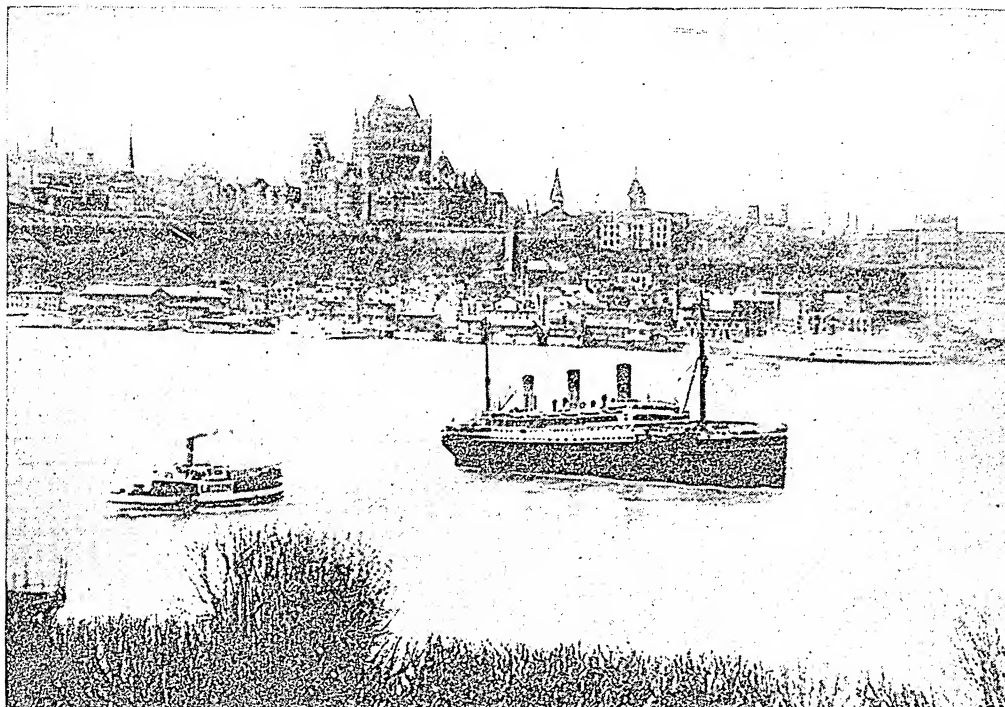


Photo: Keystone

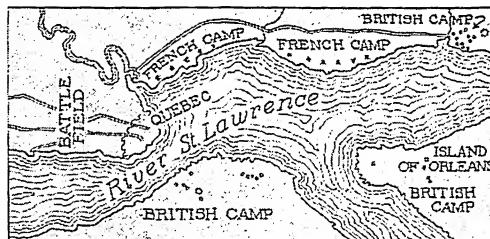
THE SAINT LAWRENCE RIVER AT QUEBEC

Quebec celebrated its Tercentenary in 1908. It remains, as always, a place of charm and interest for historian, student, and traveler. The near-by Plains of Abraham, now a public park with a monument marking the spot where General Wolfe fell; Wolfe's Cove, where the English landed for their attack; beautiful Montmorency Falls; Sainte Anne de Beaupré, with its relics; and other places of scenic or historic interest set Quebec apart as a city of distinctive quality. G.H.L.

QUEBEC, BATTLE OF. This battle, fought between the French and the English on the Plains of Abraham, adjoining the city of Quebec, September 13, 1759, marks the turning point in the long struggle of the French and English for the possession of North America. In 1759 William Pitt, Prime Minister of Great Britain, resolved to complete the conquest of the French in America and bring the French and Indian Wars to an end. He planned two campaigns. One, under Amherst, was to invade Canada by way of Lake Champlain and capture Fort Ticonderoga and Montreal; the other, under Wolfe, was to sail up the Saint Lawrence River and capture Quebec.

Early in June, Wolfe, with a trained army of 8,000 men, appeared before Quebec and began a siege of the city, which the French considered could not be taken by assault, since the high, steep promontory upon which the fortress was built made the fort inaccessible from the

river, while the guns of the fort could sink any ship that attempted to pass them. For several miles on each side of the promontory on which Quebec is built, the north bank of the Saint Lawrence is high and steep. Along these



MAP OF BATTLEFIELD

heights the French forces under the command of Montcalm were stationed. Wolfe landed his army on the isle of Orleans, four miles below the city. He then sent a detachment to Point Levis on the south bank of the river directly opposite the Citadel. From these two points, the British bombarded the city with such success that the inhabitants were compelled to abandon their homes. The main fort, however, remained intact.

On July 31 the British made an attack on Beauport, which resulted in failure, but a detachment of the British forces encamped on the opposite side of the Montmorency, where

they remained until they were withdrawn for the final assault upon the city. Wolfe now conceived one of the most daring projects in military history. He would scale the heights in the night, and attack Montcalm in the rear. The plan was desperate. If it succeeded, Quebec would be won; if it failed, the British army would be destroyed.

The most careful preparations were made. The time chosen was when there was no moon, and the bed of a little brook (then dry) was selected as the pathway up the ascent. On the night of September 12, the British forces rowed to the designated point with muffled oars and began the ascent in single file. Before daybreak, Wolfe had drawn up his 3,600 men in battle array on the Plains of Abraham. The French were amazed, but Montcalm brought his forces to the attack in good order. The British officers, however, had commanded their men to reserve their fire until the enemy was within forty paces, and the first volley piled the ground with heaps of slain. The French line broke and fled, and all the efforts of their officers to rally them for a second attack were in vain. The battle was short, but Quebec was won. Both commanders lost their lives, but within a few days, the city surrendered to General Townshend, the British commander who succeeded General Wolfe.

With the fall of Quebec, the French lost all hope of retaining their American possessions, and at the Treaty of Paris, 1763, all of Canada was ceded to Great Britain. The Battle of Quebec, therefore, was one of the most important military events in American history. At the celebration of the Tercentenary of the founding of Quebec, in 1908, this field and the battle ground of Saint Foy were made into a national park and given the name *Battlefields National Park*. See illustration, page 7711.

Related Subjects. The reader is referred in these volumes to the following articles:

French and Indian Wars	Quebec (city)
Montcalm, Louis Joseph	Wolfe, James

QUEBEC ACT, an act passed by the British Parliament in 1774 for the purpose of organizing the government of Canada, which had

been acquired from France in 1763, at the close of the French and Indian Wars. For ten years, affairs in the new possession were in a troubled state. The "new subjects," as the French-Canadians were called, desired to continue their "ancient customs and usages," particularly in the administration of justice. They were accustomed to trial by a judge without a jury, and to other features which the "old subjects," the English colonists, did not like. General discontent made a definite arrangement necessary, and in 1774 Parliament organized the province of Quebec.

The Quebec Act included three provisions which caused indignation among the English-speaking colonists. First, the province of Quebec was extended to the frontiers of New England, Pennsylvania, and New York provinces, the Ohio, and the left bank of the Mississippi, a section which the colonies on the Atlantic coast claimed by their original charters. Second, in this territory the act substituted French for English civil law. Third, the act withheld the privileges of representative government from the inhabitants.

The Quebec Act was justified in the eyes of its supporters by the arguments that most of the settlers in the Northwest Territory were French, and that they were not acquainted with, and did not want, English law and institutions. The English colonists, however, regarded the act as a blow at them and their desire for expansion. For this reason, the Quebec Act was one of the chief factors in stirring them to revolt. Even in England there was considerable resentment, and charges were publicly made that the interests of the English Protestant colonists were being sacrificed to those of the French Catholics. Parliament's desire to conciliate the French-Canadians was rewarded only a year later, when Quebec refused to join the English-speaking colonies to the south in their revolt against the mother country. See CANADA (History: After Britain's Conquest).

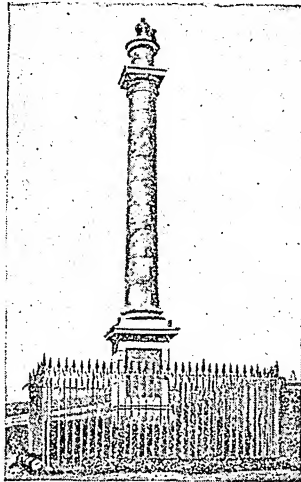
QUEBEC BRIDGE. See pages 949, 5911.

QUEBEC TERCENTENARY. See QUEBEC (History).

QUEBRACHO, *kay brah' cho*, a tree which is a valuable source of tannin. See PARAGUAY (Products).

QUEEN, the title given to a woman who is the sovereign ruler of a state. Her official designation is *queen regnant*. The wife of a king is, by courtesy, addressed as queen, but her legal position is that of *queen consort*. The mother of a king is a *queen mother*, and the widow of a king is a *queen dowager*. The present form of the word is derived from the Old English *cwene*.

A queen regnant has every political right, duty, and obligation of a male sovereign. The queen consort is a subject of the king, but has

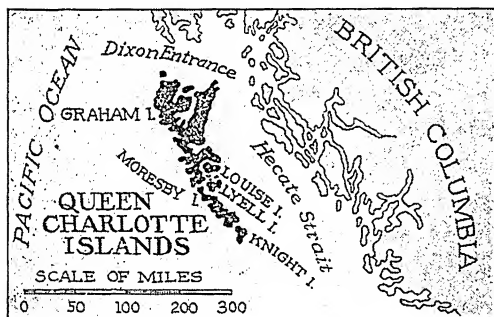


BATTLE MONUMENT
On the Plains of Abraham.

certain privileges not accorded other women of royal birth. In most countries under monarchical rule, her rights and liabilities and general political and legal status are the same as those of a woman who has no husband. Financial provision is made for her by law. The queen dowager has practically the same standing, privileges, and support as the queen consort, except that it is not high treason to conspire to put her to death, as is true of an attempt upon the life of a queen consort, because the succession to the throne is not endangered thereby. Such a crime is simply murder, as in cases affecting persons of less exalted stations.

QUEEN ANNE'S WAR. See FRENCH AND INDIAN WARS.

QUEEN CHARLOTTE, shahr' lot, ISLANDS, a small group of islands lying off the coast of British Columbia, and for governmental purposes a part of the province. Geologically, however, like Vancouver Island, 130 miles to the southeast, they are the remnants of an extinct mountain range which belonged to a different era from the mainland.



LOCATION MAP

Except on Graham Island, which is chiefly a rolling plain, the surface is mountainous in character, though it nowhere reaches an altitude of more than 5,000 or 5,500 feet. There are coal deposits of good quality, besides abundant timber and some minerals. Halibut-fishing in Hecate Strait, which separates the islands from the mainland, is a large industry. The area of the islands is about 5,100 square miles. The population in 1941 was 2,335.

The inhabitants, except for white settlers, are the survivors of the Haida tribe of Indians, now no more than 700 in number. This was the finest and most advanced of the Pacific coast tribes. It had developed Indian art to its highest degree; its carved totem poles are considered the most remarkable on the Pacific coast (see TOTEM). The islands were discovered by Captain Cook, about 1778, and were named by Captain Dixon, who visited them in 1787 in his ship, the *Queen Charlotte*, and claimed sovereignty for Great Britain.

QUEEN CITY OF THE ADRIATIC, a name applied to Venice (which see).

QUEEN MARY, THE. See SHIP.

QUEEN OF HEARTS (poem). See LANGUAGE (Steps in the Study of Language: First Year).

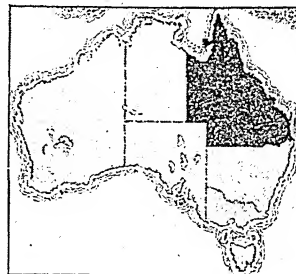
QUEEN OF SHEBA. See ETHIOPIA; SOLOMON.

QUEENSBERRY, kweenz' bur ie, JOHN SHOLTO DOUGLAS, Marquis of (1844-1900), an English patron of sport. He succeeded to the title of marquis at the age of fourteen. The next year he joined the army, remained for five years, and from 1872 to 1880 represented Scotland in Parliament. The rules for prize fighting which he helped formulate in 1867 were called the Queensberry Rules, and are yet used, though modified. See BOXING (Marquis of Queensberry Rules).

QUEENS COLLEGE. See COLLEGE OF THE CITY OF NEW YORK.

QUEENSLAND, kweenz' land, the second largest state of the Australian Commonwealth, ranking next to Western Australia. It occupies the entire northeastern part of the continent. Having an area of 670,500 square miles, it is more than one fifth as large as Continental United States, and about three times the size of Manitoba. A wedge-shaped peninsula extends northward, enclosing the Gulf of Carpentaria, and the state has over 3,000 miles of seacoast. The Great Barrier Reef, a coral ridge off the east seacoast, extending for a distance of over 1,200 miles, encloses a broad, quiet bay, dotted with numerous islands and forming many fine harbors (see AUSTRALIA [Physical Features]).

For about 300 miles inland, the eastern section is rugged and mountainous, some of the wooded peaks rising more than 5,000 feet above the sea. The western section is a treeless, grass-covered plain, broken by a spur of mountains, and underlain by extensive coal beds. Queensland has many navigable rivers. Mangrove thickets and dense tropical forests, luxuriant with palms, pines, bamboo, and ferns, border these streams.



LOCATION MAP

Showing position of Queensland in the Commonwealth and the proportion of the continent occupied by it.

The climate is equable, and even in the arid sections, the temperature rarely rises above 95° F. The rainfall is abundant on the east coast, averaging 150 inches in the north. It decreases to twenty inches in the interior, and



Photo: Commonwealth Immigration Office

TROPICAL BEAUTY IN QUEENSLAND

averages but six inches a year in the extreme west.

The People. The inhabitants number 1,015,927 (1939 estimate). The majority of them are Australian-born or are from the British Isles, the remainder chiefly Asiatics, Polynesians, and aborigines.

There is no State Church, but over one third of the inhabitants are members of the Church of England. The Roman Catholics constitute the next largest religious body, followed by the Presbyterian, Methodist, and Lutheran denominations.

Primary education is free and compulsory, and the percentage of illiteracy is low. There are separate secondary schools for girls and boys, technical schools, a university at Brisbane, and many private institutions. Charitable institutions, including hospitals, asylums, and homes, are supported by a state endowment and public subscription.

Industries. In the eastern section, hundreds of artesian wells encourage large crops of hay, wheat, maize, and potatoes; and many varieties of tropical fruit, including bananas, pineapples, grapes, and oranges, are grown on the well-watered coast. Sugar cane, however, is the most important commercial crop, and considerable cotton is cultivated. Large flocks and herds are pastured in the arid, western plains, and dairying is a rapidly growing industry in the south. Queensland produces nearly one half of the cattle of the Commonwealth. About ninety-four per cent

of the total area of the land belongs to the Crown, and is leased for pastoral and agricultural purposes.

The mountains are rich in gold, silver, tin, copper, and bismuth, and the state promises to become important in the production of coal. There are large exports of gold, wool, meat, sugar, and hides; nearly all the needed manufactured articles are imported, the industries of the state being chiefly devoted to cotton and sugar manufacture, brewing, meat-packing, and tanning.

Government and History. The chief executive officer is a governor, appointed by the British government, who is assisted by an executive council of ten ministers. The legislative department consists of a parliament made up of the legislative assembly of seventy-two members, elected for three years. Woman suffrage prevails in Queensland, as in the other Australian states. The state is represented in the Commonwealth Parliament by ten Representatives and six Senators. Most of the railroads, which have a mileage of over 6,000, are controlled by the state.

Portuguese sailors in 1605 were probably the first Europeans to know this territory, and when Captain Cook came upon the region, in 1770, he took possession, calling it New South Wales. The first settlement was a penal colony established in 1826 on Moreton Bay. The convict population gradually disappeared, and attempts to re-establish it were frustrated by the free inhabitants. In 1842 the region was

opened to free settlers only. In 1859 Queensland, which had been a part of New South Wales, was made a separate colony, in spite of the opposition of the mother colony. Seven years later, a financial crisis in which banks failed, London loans collapsed, and the government treasury became depleted, threw the country into a panic which might have crushed the people completely, had not rich gold fields been discovered the same year. Mining became the principal occupation, and the development of the country was general and rapid.

Cotton-raising for British textile mills became important during the American War of Secession, and once started, continued to prosper. Sugar-growing, for which coolies from the South Sea Islands were imported, flourished. Confederation with the Australian Commonwealth did not greatly concern the people, and they sent no representative to the convention at Melbourne. However, in 1899 the enabling act was passed, and when submitted to a referendum, later in the year, the Constitution for the new federation was ratified by a small majority.

Brisbane, *bris' bane*, the capital, is a city which originated in a convict settlement established in 1826. It was named after Sir Thomas Brisbane, a former governor of New South Wales, who was instrumental in removing the convict settlements and materially assisted in the development of the country.

The city is well situated on the Brisbane River, near the Pacific coast, and is the chief seaport of Queensland. Its commercial importance has increased rapidly, owing to the quick settlement of the surrounding country. The chief industries are the manufacture of boots and shoes, and soap manufacturing; the city has numerous breweries and distilleries, and is an important center of the wool trade.

Brisbane is a busy, prosperous city, clean and well planned, and is the seat of Queensland University, established in 1911. South Brisbane and suburbs were merged with the city in 1925, giving greater Brisbane an area of 385 square miles. The population is 313,430 (1936 estimate).

QUEENSTON HEIGHTS, BATTLE OF. See WAR OF 1812.

QUEENSTOWN, now officially COBH, a city of Ireland (Eire). See IRELAND (The Cities).

QUELPAERT ISLAND. See CHOSEN.

QUERCUS. See OAK (Scientific Names).

QUETTA, *kwet' ah*, the capital of Baluchistan (which see).

QUETZAL, OR QUEZAL, *ket sahl'*, or *ket' sal*, a brilliantly colored bird of the trogon family, found in Central America. It has a short neck, small, weak feet, a round crest, and enormous tail coverts, three and a half feet long. The upper part is bronze-green, the lower crimson. The female has no long tail coverts, and is colored brown and buff. The quetzal haunts the thickest parts of the forest, clinging to

trees, like the woodpecker, but because of its weak feet, it is unable to walk or climb with ease. It is not shy and is very unsuspicious; the natives often kill the birds with clubs. The cry is two plaintive notes, swelling to a discordant scream. The bird builds no nest, but bores a hole in rotten stumps or trees. It lives chiefly on fruit, lizards, small crabs, and insects.

The quetzal is the national bird of Guatemala, and in ancient times, only chiefs were allowed to wear its feathers. See TROGON. D.L.

Scientific Name.

Quetzals belong to the family *Trogonidae*. The species described is *Pharomacrus mocino*.

QUETZALCOATL, *ket sahl ko ah' t'l*, a deity of the Aztecs. See AZTEC.

QUEUE, *ku*, the long hair of Chinamen, worn in a single braid. See CHINA [History: (Early Modern Period)].

QUICHUA, *ke choo' ah*. See INCA.

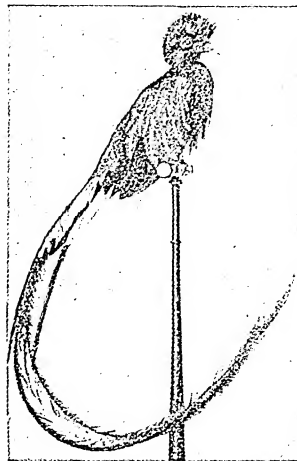
QUICK CONSUMPTION. See TUBERCULOSIS.

QUICK GRASS. See COUCH GRASS.

QUICKLIME. See LIME.

QUICKSAND, a mass of loose sand mixed with water to such an extent that it is incapable of supporting a heavy body. The grains of sand, which have smooth, rounded surfaces, do not cling together to form a compact mass. Quicksands are often formed in the mouths of rivers or in their channels, or on seacoasts. Some quicksand may be firm and dry for hours, but when it is wet, it becomes unstable and dangerous. Men and teams, as well as wild animals, have lost their lives by sinking in deep quicksands, which are not easily distinguished from ordinary sand, and so are often dangerous traps. Operating in quicksand is one of the difficult problems of engineering. One method of overcoming its instability consists in sinking into it pipes, through which a very cold brine is circulated, as a result of which the surrounding mass is frozen hard. Caissons are also used. See CAISSON. L.LaF.

QUICKSILVER. See MERCURY (metal).



THE QUETZAL

It is a bird of freedom, and will not remain alive in captivity. A legend states that, when captured, it will curl up and break its long, sweeping tail, and then die of grief.

QUILL. See FEATHER.

QUILLER-COUCH, *kwiil' ur kooch'*, SIR ARTHUR THOMAS (1863-), an English novelist, essayist, and poet, well known under the pen name of "Q." He was born in Cornwall. After taking his degree at Trinity College, Oxford, where for a time he lectured on literature, he began his successful career as editor and writer. Establishing himself at first in London, in 1891 he left that city to reside at Fowey, Cornwall, a region which he has faithfully pictured in many of his writings. He was knighted in 1910, and two years later was appointed King Edward VII professor of English literature at Cambridge University.

His Literary Achievements. The first publications of Quiller-Couch were romances on the order of Stevenson's, and include *Dead Man's Rock*, *Troy Town*, and *The Splendid Spur*. Years later he was called upon to finish Stevenson's fascinating tale of *Saint Ives*, a task which needed his bright imagination and talent for vivid description. Among later novels are *The Blue Pavilions*, *The Ship of Stars*, *Fort Amity*, and *News from the Duchy*. He also wrote short stories, volumes of poems and essays, and collected and edited two delightful anthologies of English poems—*The Golden Pomp* and *Oxford Book of English Verse*. Among his essays are *Adventure in Criticism*, *From a Cornish Window*, *On the Art of Writing*, and *On the Art of Reading*.

QUIMPER, *kaN par'*, an interesting old city of Brittany. See FRANCE (back of map).

QUINCE, *kwiins*, a shrub or small tree of the rose family, which produces a fruit much used in making jellies and as a preserve. The tree, which is native to Asia, is now cultivated throughout Europe and in various parts of America. The fruit is golden-yellow and very hard, and in shape resembles both the apple and the pear, to which it is related. When fresh, it puckers the mouth, and is never eaten raw, but it has a delightful taste when cooked, and is a favorite flavoring in marmalade and other fruit preparations. In America, quinces may be raised as far north as New York; in that state are found the best orchards of any in the United States. The plant is propagated by cuttings. Some varieties are used as stock for dwarf varieties of pears (see PEAR). B.M.D.

Classification. The botanical name of the quince is *Pyrus cydonia*, family Rosaceae.

QUINCY, *kwin' sic*, ILL. See ILLINOIS (back of map).

QUINCY, *kwin' sic*, JOSIAH (1772-1864), an orator, lawyer, statesman, and educator, born in Boston and educated at Harvard College. In 1804 he was elected by the Federal party to the Massachusetts senate, and the next year he entered Congress. There, as an opponent of Jefferson's policies, he displayed such power as a fiery orator that he quickly became a Federalist leader in the House. As one of

the first men in that body to denounce slavery, he feared the purchase of slave-holding Louisiana, and declared the act sufficient cause for disunion. This was the first declaration in Congress of the secession doctrine. In 1812 he was so enraged by the American declaration of war against Great Britain that he refused a reelection to Congress. In 1823 he began a notable career as mayor of Boston. Quincy accepted the presidency of Harvard University in 1829, and during the sixteen years of his administration, made extraordinary improvement in the school's equipment, methods, and standards.



Photo: Brown Bros.

JOSIAH QUINCY

QUINCY, MASS., a residential city in Norfolk County, situated on Quincy Bay, and separated from Boston by the Neponset River on the north, and from Weymouth by the Fore River on the south. The city has a fine system of parks, of which Merrymount and Faxon are the most important. Formerly the quarrying of granite was the chief industry, but within the last few years, manufacturing has greatly increased. Population, 75,810 (Federal census of 1940).

Transportation. Quincy is served by the New York, New Haven & Hartford Railroad and by interurban electric lines. The first railroad in New England was built here in 1826, for carrying granite from the quarries to tide water. The road was about four miles long, and the cars were drawn by horses.

Industries. Aside from the large granite quarries, the city has paint factories, rubber-goods factories, shipyards, brass and iron works, and factories producing automatic weighing and packaging machines, tubular rivets, foundry and electrical goods, and gears.

Institutions. Prominent features of the city include the Woodward Institute, an endowed high school for girls; and Crane Memorial Library.

History. The site of the present city was settled in 1625 as Mount Wollaston. Four years later, Thomas Morton gained control of the settlement and established the famous "New England Canaan," or "Merrymount." He instituted many practices against the wishes of the Pilgrims, and, not heeding remonstrances, was captured by Captain Miles Standish in 1628, and sent back to England. The settlement was a part of Braintree until 1792, when it was incorporated and named in honor of John Quincy. A city charter was granted in 1888. Quincy was the birthplace of two Presidents—John Adams and John Quincy Adams—and of John Hancock. F.A.M.

QUININE, *kwi' nine*, an exceedingly bitter medicine obtained by a secret process from the bark of certain trees (genus *Cinchona*) native to South America, but grown in India and other tropical countries. Quinine is chiefly valuable as a specific remedy for malaria. It also is effective in allaying fever, and is a nerve stimulant and general tonic through its power of increasing the flow of the digestive juices. Quinine solution injected into the rectum is a worm-expeller. In influenza, neuralgia, and headache, the drug is taken for the relief of pain. It is a common remedy for colds. Large doses cause ringing in the ears, dizziness, and pain in the head, and dangerously affect the blood pressure, even causing death, and the drug should be taken only as prescribed by a reliable physician.

Chemically, quinine is a compound of carbon, hydrogen, oxygen, and nitrogen. When pure, it forms silky, needle-like crystals that unite with acids to form salts. That is, it is an alkaloid. Industrially, quinine is valued as an ingredient of hair tonics.

Related Subjects. The reader is referred in these volumes to the following articles:

Alkaloids	Malaria
Atabrine	Medicine and Drugs
Cinchona	Peru (History)

QUINNOT, *kwin' at*, a species of salmon (*whick-see*).

QUINSY, *kwin' zie*, a form of sore throat which usually results in the formation of an abscess in the region of the tonsils. One or both sides may be affected. It is caused by germ infection, following exposure to cold or dampness, and begins with chills, exhaustion, fever, and pain in the throat. As the disease progresses, the affected tonsil swells until swallowing and even opening the mouth become exceedingly difficult and painful. In severe cases, the patient has alternate chills and sweats, and at night becomes delirious. Though the ailment is not usually fatal, generally ending in from five to eight days with the bursting of the abscess, there are cases on record of death by suffocation, caused by the bursting of the abscess while the patient was asleep. If taken in time, an attack can often be promptly checked. The patient should rest quietly in bed, gargle the throat, and take purgatives. A developed case needs the attention of a reliable physician. Lancing the abscess, with draining of the pus, always brings immediate relief. Quinsy does not usually attack children or people past forty, but the same person may suffer from recurring attacks. It is generally advisable to remove diseased tonsils. See **TONSIL**.

W.A.E.

QUINTE. See **FENCING**.

QUINTILIAN, *kwin' til' ih an* (MARCUS FABIVS QUINTILIANUS) (about A.D. 40—about 118), a Roman rhetorician, born at Calagurris,

in Spain. Information about his life is meager, but it is probable that his family removed to Rome while he was a boy, and that there he grew to manhood. After spending some years in Spain, he returned in 68 to Rome with Galba, and began to practice as an advocate. It was as the head of a school of oratory that he was best known, however, and Vespasian created for him a liberally endowed chair of rhetoric. He taught for about twenty years, and after his retirement spent two years in the composition of his great work—*Institutio Oratoria*, an exhaustive system of rhetoric, dealing with the training of a would-be orator from infancy. Quintilian's literary judgments are most true and sympathetic, perhaps the best in ancient literary criticism. There are extant 164 declamations which are credited to Quintilian, but their authorship is by no means certain.

W.L.C.

QUINTILIS. See **JULY**.

QUINTUPLETS, five individuals born of a plural birth. Such an occurrence is comparatively rare among human beings. Medical history records about thirty instances, only twenty of which are thought to be authentic by some authorities. None of the quintuplet groups lived except one that survived for fifty minutes, and one individual from another group that lived for fifty days. Famous as the only quintuplets to live more than a few minutes are the five daughters of Oliva and Elzira Dionne, born at Callander, Ontario, Can., May 28, 1934. Unique, also, is the fact that at the age of two years every one of them had had a normal physical and mental development; on their fifth birthday the robust quintuplets had a combined poundage of 225.

Ontario passed the Dionne Quintuplets Guardianship Act in March, 1935, by which Emelie, Marie, Cecile, Yvonne, and Annette became wards of the Crown in collaboration with the Canadian Red Cross Society.

Other human multiple births of infants are quadruplets, triplets, and twins. Such births are much more common than quintuplets. The frequency of each type has been observed as decreasing with the number of individuals born, and this general tendency is stated in Hellen's Law, named in honor of the man who discovered the so-called series. According to this law twins, triplets, and quadruplets occur once in 88, 88², and 88³, respectively; or twins once in 88 births, triplets once in about 7,700 births, and quadruplets once in about 700,000 births. Carried out to 88⁴ to cover quintuplet frequencies, the number would be quintuplets once in about every 60,000,000 births, or as one authority interprets it, once in a human generation.

QUIPU, *ke' poo*, an element in Inca education. See **PERU** (History).

QUIRINAL, *kwi' ri' nal*, or *kwi' ri' nal*, a

famous hill of ancient Rome, apart from the older City of the Seven Hills, but included in the area within the Servian Wall. Quirinus, the god in whose honor the hill is named, was the third most important of Roman deities, ranking next below Jupiter and Mars. On the hill, in the days of the city's ancient splendor, were the temple of Quirinus and the baths of Constantine and Diocletian. See **ROME**, for map; see, also, **QUIRINUS**.

Quirinal Palace, a palace in Rome, on the Quirinal Hill, which since 1870 has served as the residence of the kings of Italy. Previous to that time, it was a summer residence of the Popes, having been begun for that purpose by Gregory XIII in 1574. Noteworthy among the works of art which it contains is an *Annunciation* by Guido Reni.

QUIRINUS, *kwi ri' nus*, the name given in ancient Rome to a deity who held third place in the Pantheon; only Jupiter and Mars outranked him. At the time of the supremacy of Rome, there grew up a tradition that this god was Romulus in his deified state. Extraordinary honors were paid him, and his festival was on February 17. See **PANTHEON**.

QUIRITES, *kwi ri' teez*, a name applied to the citizens of Ancient Rome with reference to their civil relations. It was distinguished from *Romani*, which was applied to the citizen body in connection with military and political affairs. It is supposed that *Quirites* was the original name of a tribe of the Sabines, and as both Romans and Sabines composed the nation, it was appropriate that the two terms should be used to designate its citizens.

QUITCLAIM. See **DEED**.

QUITO, *ke' toh*. See **ECUADOR** (The Cities).

QUITUS, an ancient kingdom. See **ECUADOR**.

QUIXOTE, **DON**. See **DON QUIXOTE**.

QUOITS, *kwoits*, a pastime resembling discus-throwing, and consisting in the tossing of iron rings, also called quoits, at a peg thrust into the ground. In America horseshoes are frequently substituted for quoits. The pegs are usually set thirteen yards apart. The

quoits are eight inches in diameter, with a rim from one to two inches in breadth. Each player pitches two quoits, and then yields his place to an opponent. As many as desire may take part. The aim is to ring the peg with a quoit. A score of 11, 21, or 50, as may be agreed upon, constitutes a game. In a game of 11 or 21 points, a *ringer*, a quoit which encircles the peg, counts 3; a *leaner*, a quoit which leans against the peg, counts 1; and if there are no ringers or leaners, the nearest quoit counts 1. As the game is sometimes counted, a ringer scores 5, a leaner 3.

QUORUM, *kwo' rum*. In the organization of an assembly, a quorum is the number of members who must be present in order that the body may transact business legally.

In public bodies, the quorum is usually fixed by the constitution or by-laws. When the assembly is a representative body, performing the functions of government for a constituency, or when the body is of the nature of a board of managers, or trustees, carrying on the business of the corporation which elected them, a majority of the members usually is required to form a quorum, and no action of the members themselves can at any time change this requirement.

In the halls of probably every legislative body in the world, measures are debated when a quorum is not present, by general consent not to recognize the fact, but when the hour for voting is reached, a hurried call for absent members usually brings to their seats a number sufficient to give legality to the proceedings. See **PARLIAMENTARY LAW**.

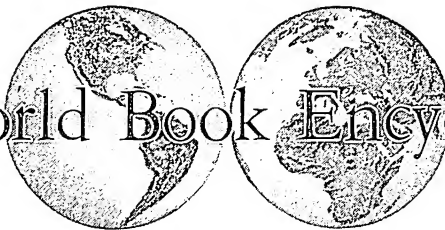
QUOTATION, *kwo ta' shum*, **MARKS**. See **PUNCTUATION**.

QUOTIENT. See **DIVISION**.

QUO VADIS. See **SIENKIEWICZ**.

QUO WARRANTO, a Latin phrase meaning "by what authority." It is a writ or proceeding by which a court makes inquiry as to the right of an individual, company, or corporation to hold office or franchise, either not lawfully held or the right to which may have been forfeited by abuse or neglect.

The World Book Encyclopedia



Rr

R is the eighteenth letter of the English alphabet. The Phoenician letter from which it was derived was called *resh*, which meant *head*; in form it probably originally represented a head in profile. It was more like a *P* than an *R*, but was turned around with the projection to the left, and this upper part was angular instead of curved. The Greeks adopted the letter and made it precisely like a modern capital *P*, but the Romans added the extra line to distinguish it from the *P*, which with them assumed its present form.

In sound, *r* has always been practically what it is in English. It is a consonant, but has much of the character of a vowel, and is therefore classed with the semi-vowels. It closely resembles *l*, from which some peoples find it impossible to distinguish it; and the two have been frequently interchanged in the history of words. Theoretically, *r* is pronounced with a slight trilling sound; in reality, it is rarely so used in English except in singing. Many persons never pronounce an *r* unless it is followed by a vowel, sounding *far* almost as if it were spelled *fah*; but it always serves to modify somewhat the vowel sound which precedes it.

RA, the Egyptian god of the sun. See **RE**.
RABAT, *rah baht'*. See **MOROCCO** (The Cities).

RABBI, *rab' i*, a name of respect which the Jews applied to a doctor or teacher of the law. Another form of the word, and one denoting even greater respect, was *rabboni*. Neither of the words was used in Old Testament times, but they seem to have been in very general use at the time of Christ, for His Disciples often addressed Him by one of the two terms. In *John* 1, 38, the word *rabbi* is translated *master*. Rabbi is now the title of the minister or preacher in the present-day Jewish synagogue.

It is translated today as *master*, *lord*, or *teacher*, with almost reverential meaning.

RABBIT, *rab' it*, an interesting representative of the rodent group (the gnawing animals). The wild rabbit is a native of Europe, but domesticated species are found in most parts of

the world. Rabbits belong to the same family as the hare, and in America the two names are often, though incorrectly, used interchangeably (see **HARE**). The "jack rabbit" has no right to its name, as it is a hare, while the "Belgian hare" is a rabbit.

Rabbits differ from hares in appearance, in that they are smaller and have shorter ears and legs; they differ in habits, in being less fleet, in living in colonies in underground

burrows, called *warrens*, and in giving birth to blind, almost hairless, young. Like hares, they multiply rapidly, breeding several times



Photo: U & U

A WILD RABBIT BEING FED FROM A BOTTLE



Photo: U & U

ON THE ALERT, READY TO FLEE FOR HIS LIFE

Nature photography is an art. Here is a rare picture caught by the camera. A wild rabbit in its nest, ears back and nose quivering, feels safe only when no noises are heard.

a year. They begin breeding at the age of six months, and produce five to eight young at a birth. Tender grass, clover, lettuce, cabbage, and bark of young trees are favorite foods. Great damage is often wrought by hungry rabbits, and in Australia and New Zealand, they have increased so rapidly as to become pests. There the farmers protect their crops with specially made wire fences. The favorite haunts of the rabbit are hillsides and sandy heaths. Its means of protection from its enemies are keenness of scent and hearing and fleetness of foot.

Native rabbit fur is soft and fine, and of a nearly uniform brownish color. That of some species turns white in winter. In its natural white state, or dyed in a variety of colors, rabbit fur is an important item in the fur trade (see FUR AND FUR TRADE). It is marketed under numerous trade names, including Baltic leopard, Arctic seal, beaverette, chinchillette, cony, electric beaver, electric mole, electric seal, erminette, French chinchilla, sealine, etc., etc. The skin, cleared of hair, is used with other skins to make glue and size. Rabbit fur is utilized considerably in manufacturing felt hats (see HAT).

Domesticated Rabbits. The texture of rabbit fur has been changed through domestica-

tion, and in ten distinct varieties, the color varies from white to black. Changes in the appearance of the ears have also developed, some being small, erect, and stiff, and others broad, soft, and hanging. The following are the more important kinds of domesticated rabbits:

Belgian Hare. This is one of the best-known varieties in America, and it is a true rabbit. It is a large animal, weighing about ten pounds, and has a broad head which tapers to the nose; the long ears are thin and translucent, and the eyes are bright brown. This rabbit is easily raised, and its flesh is considered excellent.

Lop-Eared Rabbit. This rabbit, distinguished by its long ears, which are about twelve inches in length, is the oldest fancy variety. It requires much careful attention.

Dutch Rabbit. This rabbit, which weighs only four pounds, is one of the smallest of domestic rabbits. It is hardy and beautifully colored, the fur being a combination of white and of black, blue, or lemon.

Angora Rabbit. Like Angora goats and cats, the Angora rabbit has a silky coat of white hair about six inches long, which can be cut and woven. This breed is also hardy.

Other Kinds. These include the dark, silky-haired *Siberian*; the *Himelcayn*, valued for its skin, which closely resembles ermine; the large *Patagonian* and *Flemish* rabbits; the fancy *silvertip*; and the delicate white *Pole*, weighing only three pounds.

Among the gentlest and friendliest of animals, all these breeds of rabbits make excellent pets for children.

Commercial Rabbit Production. Rabbits have long been raised for food, but a boom in their production generally occurs only in times of meat shortages. The United States experienced such a boom during World War I, when California came into its own as a rabbit-producing state. Within a few years the industry had spread to Colorado and to the three central states of Ohio, Indiana, and Illinois. The necessity of rationing beef, pork, and other meats during World War II again aroused an interest in rabbit production, and consumers in all parts of the country came to prize the white, fine-grained flesh of the young animals for frying and of the older ones, used chiefly for roasting and stew-making.

The medium-sized and larger breeds such as Flemish Giant, Belgian Hare, American, New Zealand Red or White, French Silver, Beveren, and Chinchilla have been found best suited for meat raising. Care must be exercised in feeding them so that they may be kept in as healthy a condition as possible. About two thirds of their diet consists of chopped alfalfa, clover, timothy, and other leguminous hays. Soybean, linseed, and peanut meal supply proteins essential to flesh-forming. From such grains as rolled or ground barley and oats, such green feed as cabbage, kale, and lettuce, and such root crops as carrots, turnips, and beets, the animals obtain the necessary vitamins. They should also be kept well supplied with pure, fresh water and should receive a small amount of salt each day. The amount of grain fed them in the morning and of hay at the heavier evening meal depends on age and appetite.

Climate has a great influence upon the kind of buildings in which rabbits are housed. In a mild climate, such as that of California, the hutches are constructed almost entirely of wooden supports and wire netting. A good roof is necessary, however, to shield the animals from rain in winter and from the hot rays of the sun in summer. In the central states the sides as well as the roof of the hutches are built of wood and sometimes of steel. They range in length from four to six feet and are usually two and a half feet wide and two feet high. They may also be built in two or three tiers, allowing for each mature animal and its young about ten square feet of floor space. Large commercial rabbitries have as many as five hundred hutches.

To have healthy stock, utmost care must be taken in keeping the hutches in a sanitary condition; they must be cleaned daily, rebedded with fresh straw or leaves, and occasionally disinfected. Fresh air and the sunlight which filters through a lath sunshade are also essential in preventing respiratory diseases and rickets.

The commonest diseases among domesticated rabbits are bloat disease, nasal catarrh, ear canker, and sore hocks. The wild kind are frequently victims of tularemia, popularly called rabbit fever.

As the price obtained for rabbit meat is low during the summer, breeding should be practiced so that the larger litters will arrive during the more favorable seasons. A doe ordinarily has four litters of young each year. The six to twelve rabbits in each litter are generally large enough to be marketed when they are two months old. The older rabbits are not kept for breeding purposes after they have reached the age of four years.

These various findings are based on the researches of the United States Rabbit Experiment Station, maintained by the Fish and Wildlife Service of the Department of the Interior at Fontana, Calif. Since its establishment in 1927, this station has done much toward developing rabbit culture into an important branch of American agriculture. W.N.H.

Scientific Names. Rabbits are included with hares in the family *Leporidae*. The domesticated rabbit is *Oryctolagus cuniculus*.

RABBONI. See **RABBI**.

RABELAIS, *rah b'leh'*, FRANÇOIS (about 1490-1553), a French humorist and satirist, one of the greatest literary figures in France during the sixteenth century. His most celebrated work, *Gargantua and Pantagruel*, is one of the earliest masterpieces of French prose. It relates the adventures of Gargantua, a giant with an enormous appetite, whose gluttony had made him notorious, and the amazing deeds of Pantagruel, the "king of drunkards." The work is a mingling of pure banter and keen and witty ridicule of politics, the Church, and education as they existed in the author's day.

Rabelais was by turns priest, physician, and story-teller. He was born near Chinon (?), the son of a barrister and gentleman farmer, and was educated in monastery schools. He became a monk of the Franciscan order, but his ardent love of the Hebrew, Arabic, and Greek and Roman classics offended his brother monks, and after living for a time in an abbey of the Benedictines, he gave up monastic life. In 1530 he began the study of medicine at Montpellier, where, in 1537, he was granted a doctor's de-



Photo: Brown Bros.

RABELAIS

gree. In the meantime, he was appointed head physician of the great charity hospital at Lyons, a position which he held until about 1539. For a short time, he found it expedient to remain away from France, and in the interval, he became physician to the town of Metz. Shortly before his death, he served as curate in the parish of Meudon.

R.T.H.

RABIES, *ra' bih eez*. See **HYDROPHOBIA**.

RACCOON, *rak koon'*, OR **COON**, the common names of a family of interesting little animals related to the bears. With the ex-

cold climates they hibernate in such woodland homes (see **HIBERNATION**). Although, like bears, coons eat almost anything which comes their way, frogs, crabs, turtles, and other water animals are favorite articles of diet, and juicy corn crops are often ruined by visits from these greedy visitors. They always wash their food before eating it, and are fond of paddling in water. Robbing birds' nests and raiding chicken coops are perhaps their worst faults. From three to six young are born at one time, usually in April or May. They are blind and helpless at first, and are cared for by the parents for at least a season. The cry of the young resembles that of human babies.

Coons are easily tamed and are amusing pets. In the Southern states, coon hunts on moonlight nights are a favorite sport. Roasted raccoon flesh is there considered a great delicacy, especially by the negroes. In colonial days, sleigh robes, overcoats, and caps of coonskin were popular, as were coats in modern times.

The *agouara*, or crab-eating raccoon, is found in South America. A Himalayan species is called *panda*. The *coon bear*, or *giant panda* (which see) is a related species.

From 1838 to 1844, the raccoon was the emblem of the Whig party in the United States, and members of that party were popularly called *coons*. The famous log cabins of the Harrison and Tyler campaign of 1840 always had coonskins nailed to the exterior. (See next page.)

M.J.H.

Scientific Names. Raccoons constitute the family *Procyonidae*. The common raccoon is *Procyon lotor*. The *agouara* is *P. cancrivorus*. The Himalayan genus is *Ailurus fulgens*.

RACCOON MOUNTAINS. See **ALABAMA** (The Land).

RACE, any trial of speed among contestants, such as running, rowing, swimming, riding, and driving. Since the days when the prehistoric peoples escaped the cave bear by fleetness of foot, contests of speed of both men and animals have continued to excite the keenest interest. The successful runner in the Greek games was crowned with a wreath of laurel, and was honored by all the people. The games at Rome were not less popular. In modern times, such contests are a regular part of the rivalry among colleges, especially in America. The Olympian Games, held to-day as in ancient times, include many races, among them the famous Marathon.

With the invention of mechanical devices for increasing the speed with which man is able to propel himself, bicycle, motorcycle, and automobile races were added to trotting, pacing, and running races as popular diversions. Of these, the automobile race is the most thrilling, because of the very great speed attained by expert drivers. Yachting and rowing races have their enthusiastic followers, but they can



Photo: Visual Education Service

FAVORITE RESTING PLACES

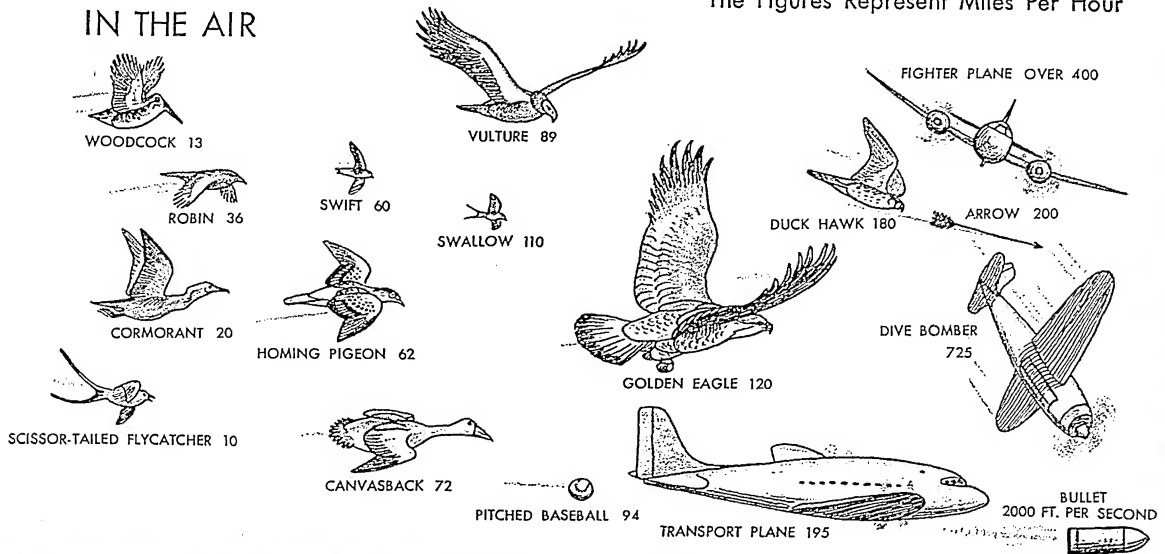
ception of one genus, all of the raccoons are found in the two Americas. The *common raccoon* is about thirty-two inches long from nose to end of tail, and weighs from twenty to twenty-five pounds. The stout body is covered with long, coarse hair, which is grayish and black-tipped. The tail is bushy, grayish-white, with definite rings of black. A coon's face, with its sharp, delicate nose, and patch of black around each eye, set off by surrounding whitish hairs, is foxlike and has a look of cunning, quite in keeping with its mischievous nature. These animals are famous tree-climbers, having long legs and strong claws. Their favorite haunts are hollow trees, and in

COMPARATIVE SPEEDS

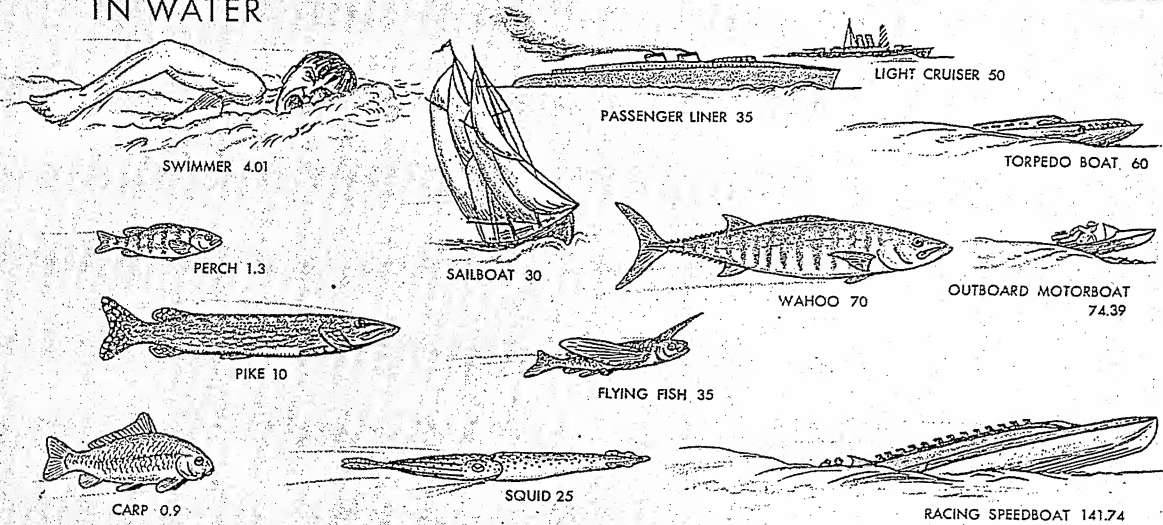
IN THE AIR, IN WATER, ON LAND

The Figures Represent Miles Per Hour

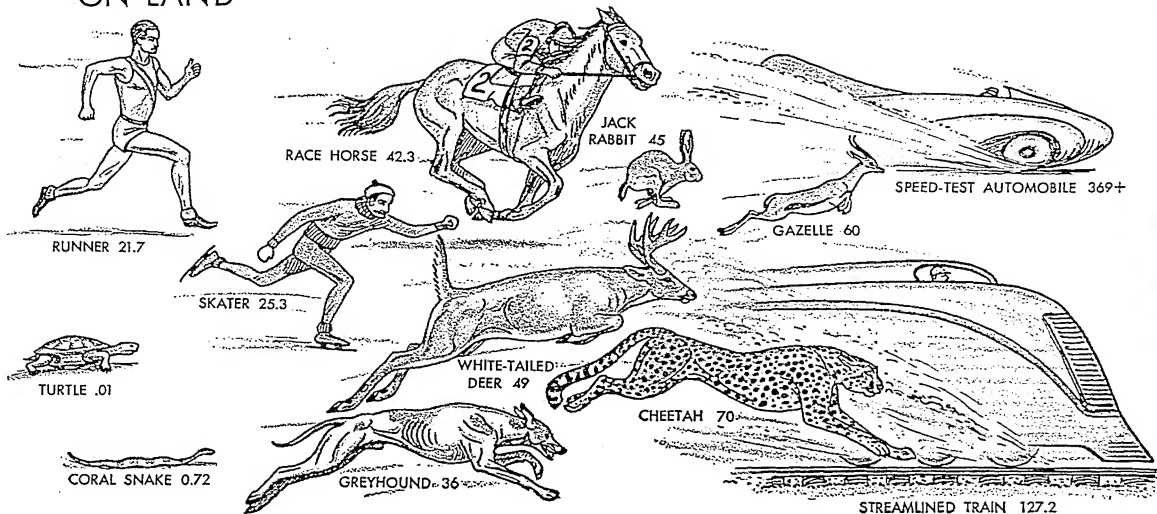
IN THE AIR



IN WATER



ON LAND



hardly be called popular sports. Bicycle racing was once almost a rival of horse racing in America, but is very little followed now except in contests on prepared courses in large buildings, continuing for six days without interruption. Records of 2,365 miles for winning teams have been earned.

Whippet racing and the breeding of these small greyhound-like dogs have long been common in English country districts. In recent years, they have become more widely popular in England and the United States, although the betting which accompanies the races has caused them to be prohibited in some cities.

Horse racing itself, once called "the sport of kings," fell upon evil days as a result of the demoralization that came from the betting ring. Races frequently were "fixed," that is, arranged between owners; and when the public came to understand that it was not always permitted to see the best horse win, interest declined, and stringent laws against betting and racing caused the closing of many race tracks throughout the country. However, the American tradition of the turf is a fine one, for American breeders produced some of the swiftest animals on the track in the days when racing was at its cleanest and best. Horses are matched in trotting, pacing, and running races, and are further divided into classes corresponding to their speed.

Speed Records by Horses. The harness race was developed in America, and the early trotters and pacers of the United States had no equals. In harness races, the mile has been the standard distance, and the time was lowered from a little more than three minutes at the time of the death of the first great trotter, "Imported Messenger," in 1808, to 2:08 $\frac{3}{4}$ in 1884. The latter record was made by one of the greatest of American harness horses, "Maud S," in competition with her equally great rival, "Jay Eye See." The introduction of ball-bearing axles and pneumatic tires a little later was an important mechanical aid to speed, and its effect has been shown in still lower records for the mile. "Lou Dillon," a comparatively unknown mare, was the first horse to trot a mile in two minutes, in an exhibition mile behind pacemakers. The fastest time for a trotter was 1:54 $\frac{1}{2}$, by "Uhlen," at Lexington, Ky., in 1913. "Dan Patch" established the pacing record of 1:55 for one mile at Saint Paul in 1906. The best running record for a mile is 1:34 $\frac{1}{2}$ established by "Equipoise," at Arlington Park, Ill., in 1932. In England running races have always been more popular than harness races, and one of the greatest turf events of the world for many years has been the English Derby, run at Epsom, near London.

In spite of restricting laws, the popular interest in racing has established the sport in

many places in the United States. Probably the most famous race is the annual Kentucky Derby at Louisville. Belmont Park, N. Y., the Lincoln Fields, Washington Park, and Arlington tracks near Chicago are the scenes of other famous races. Immense stakes are won, sometimes amounting to more than \$100,000 for the winner.

Automobile Races. Quite the most thrilling of modern spectacles are automobile contests, on speedways or country courses. They are international in character, and attract the most expert drivers of the world. Courage and staying power, together with exceptional presence of mind and constant alertness, are absolutely necessary to the driver's safety in his headlong flight over such courses as are run for the French Grand Prix, the Vanderbilt Cup, and the Speedway cups at Indianapolis. Great distances are covered in these races; the pace for the mile is less regarded than the ability of a driver to maintain a terrific speed for hundreds of miles. The record for the Indianapolis Classic was established by Floyd Roberts in 1938, who broke the record of Wilbur Shaw, made a year previously. Roberts' time was 4 hours, 15 minutes, and 58.4 seconds; or an average of 117.2 miles an hour for the 500 miles of the course. At Bonneville Flats, Ut., on August 23, 1939, John R. Cobb, driving a *Raillon Red Lion*, set a world's record of 369.7 miles an hour, breaking the 1938 record of George E. T. Eyston—357.5 miles per hour on the same speedway. Competition among builders, who wish the honor of placing a winning car in the great races of the year, is scarcely less keen than among drivers, since the advertising value is clearly recognized. The amount of money spent on automobile racing is now an enormous sum, and its popularity appears to be growing, in spite of the fatalities that are too often a result of the terrific pace maintained.

Related Subjects. The reader is referred in these volumes to the following articles:

Athletics	Motorcycle
Automobile	Olympian Games
Bicycle	Whippet
Laurel	Yacht and Yachting

RACEME, *ra seem'*, in botany, a type of flower cluster in which the flowers are borne on short, branching stems, or *pedicels*, on an elongated axis, or *peduncle*. There is no definite number of flowers, because the blooms appear as the axis lengthens, and the latter is not ended by a terminal blossom. Such a form of flowering is called *indeterminate inflorescence* (see INFLORESCENCE). The pedicels are borne in the axils of small modified leaves called *bracts* (see BRACT, for illustration). The red currant and lily of the valley are good examples of plants having *racemose* flower clusters.

B.M.D.

RACES OF MEN. The origin of man, the time of his advent upon the earth, and the manner in which the different races of men came into existence are questions that have always interested the world. Notwithstanding the fact that some of the most noted scientists of the last two centuries have devoted much time to the study of these questions, none of them is settled. Any estimate of the length of time that man has lived upon the earth is a mere hazard, as is seen by comparing the estimates of different authorities upon the subject, which vary from 10,000 to several hundred thousand years. All that can be said about the time is that it is very long, and it can be estimated only by tens of thousands of years.

There are two theories concerning the origin of man. The first is that he was a special creation, as explained in the first chapter of *Genesis*. For centuries, no other theory was considered by the Christian world, and this theory is still widely held. The second theory is that man sprang from the order of Primates, to which the apes belong, and has reached his present highly civilized state through long ages of development.

The classification of peoples is a difficult task because there has been so much mixing of blood. Two of the terms used, *nation* and *race*, are frequently misunderstood. Confusion may be avoided if we take note that "nation" is political and social whereas "race" is biological. Thus the United States is a nation, but its citizens belong to several races. Australia is a nation but its citizens are almost exclusively of one race. To guess that a person from Australia will be white, stands a good chance of being correct, but the race of a person from the United States cannot be guessed so easily. So the nation to which a person belongs is not always an indication of his race.

In our daily affairs it is more important to know to what nation a person belongs than to classify him by blood. Even primitive people are designated by tribes, or little nations. Thus to attempt a race classification is to classify the citizens of tribes and nations: as, the full-blooded members of the Iroquois tribe are American Indians, and full-blood Japanese are Mongolians.

The term *race* means classification by biological characters, or blood relationship. All human beings now living are regarded as of one zoological species, *Homo sapiens*. Yet there are differences, as in color, hair, shape, and size, which are perpetuated by inheritance, and by which human beings can be grouped as varieties or sub-species. More than a century ago five divisions were proposed; Caucasian or white, Mongolian or yellow, Negro or black, Malay or brown, and American Indian or red. Although these names are well fixed in the popular mind, anthropologists

prefer to begin with three main divisions, caucasoid, mongoloid, and negroid. These are sometimes called the primary races. Most of the known tribes and nations can be arranged under these classes, as:

1. Negroid—Bushmen, Negritos, Hottentots, African Negroes, Melanesians, etc.
2. Mongoloid—Chinese, Japanese, Koreans, Indonesians, Malaysians, American Indians, Eskimos, Lapps, Finns, Siberians, etc.
3. Caucasian—Europeans (Nordic, Mediterranean, Alpine), Canadians, Americans, Australians, Arabs, Hindus, Berbers, etc.

The theory is that in a former geological period humanity separated, forming three primary branches or races, as negroid, mongoloid, or caucasian. Yet some authorities assume that there were at first only two races, negroid and yellow-white. Later, the latter separated, forming the mongoloid and the white. No one knows how many branches and varieties of man have become extinct, so a consistent family tree can not be constructed. Then since marriages between any of these races and varieties results in offspring, rarely can we be sure as to how a given people originated. Thus, the origin of the Eskimo is still in dispute; while no one doubts that they are mongoloid, some think they are Indians, others that they are Siberians. They are probably a mixture of both. Yet such widespread races as the American Indian indicate how remote and how persistent race characters can be, as, for example, straight black hair from Alaska to Cape Horn. C.W.

Related Subjects. The reader who is interested in the details of this subject is referred in these volumes to the following articles:

Anthropology (with list of peoples)	Ethnology
Archaeology	Evolution (Lines of Evidence)
Ethnography	Geology

RACHEL, *ra shel'* (1821-1858), one of the greatest of French tragic actresses, was born in Switzerland of Jewish parents. Her real name was ELISABETH RACHEL-FÉLIX. She began her career at the age of four, singing on the streets of Lyons. Five years later, the director of a music school heard her on the Paris streets and gave her lessons. However, she soon lost her singing voice, and began to study dramatics with Saint-Aulaire, then at the Paris Conservatory. Rachel's first professional appearance, in 1838, excited no great attention, but a year later, in the *Horace* of Corneille, she won a gratifying success. In 1855 she toured the United States, but her voice was impaired. Three years later, she died of tuberculosis, and

was buried in the Jewish section of Père Lachaise, the most famous cemetery of Paris.

Her best rôles were always those in plays of Racine and Corneille, and her interpretation



ELISABETH RACHEL FÉLIX

of the leading part in Racine's *Phèdre* has never been surpassed. Within her special range—the portrayal of human suffering—Rachel has, perhaps, never had a rival.

RACHEL, *ra' chel*, the favorite wife of Jacob. To win her he served her father (Laban) seven years, "and they seemed unto him but a few days for the love he had to her" (*Genesis* XXXIX, 20). Offered Leah in her stead, Jacob had to serve Laban seven more years. Rachel's elder son was Joseph, beloved above his brethren; her younger son was Benjamin, "the little one," born in the last stages of the family's long journey from Mesopotamia to Canaan. After the birth of Benjamin, Rachel died. She was considered the tribal mother of the northern tribes of Israel, and when they were carried into captivity, she was represented as being inconsolable in her grief (*Jeremiah* XXXI, 15). This passage is quoted (*Matthew* II, 18) in the account of the murder of the innocents by Herod:

In Rama was there a voice heard,
Lamentation, and weeping, and great mourning,
Rachel weeping for her children;
And would not be comforted, because they are not.

Related Subjects. The reader is directed to the Biblical references above, to the illustration on page 5933, and to the following articles in these volumes:

Benjamin

Jacob

Joseph

RACHMANINOV, *rahk mahn' in ov*, **SERGEI** (1873-1943), a Russian composer and pianist, born in Novgorod of noble parentage. The loss of the family fortunes changed the plans that destined him for an aristocratic education, and at the age of nine, he began his musical training in the Saint Petersburg (now Leningrad) Conservatory. So great was his talent that he could have been a child prodigy had not his family preferred that he continue his studies.

In 1885, having been transferred to the Moscow Conservatory, the boy came under the influence of Tschaikovsky, Arensky, and Scriabine. He won the gold medal for composition with his one-act opera, *Aleko*, in 1892, and one year later was appointed professor of piano-forte in Maryinsky Institute, Moscow. The season of 1897-1898, he directed the private opera in Moscow, and the following season appeared in London at one of the Royal Philharmonic concerts.

Rachmaninov lived in Dresden for a few years, visited Paris in 1907, and made his first tour of the United States in 1910-1911. He then returned to Russia until 1917. After 1918 he spent much of his time in the United States, but revisited Europe on concert tours. His playing revealed an earnest, sober-minded musician, who always interpreted the composer sincerely. His own compositions follow his theory that melody is music.

Notable Compositions. Rachmaninov's compositions include the famous *Prelude in C Sharp Minor*, which is the most popular among all his works; *The Elegiac Trio* for piano, violin, and violoncello, composed in memory of Tschaikovsky; the symphonic poem, *The Island of Death*; *The Bells*, based on Edgar Allan Poe's poem; *Spring*, for chorus and orchestra; and two one-act operas, *The Accursed Knight* and *Francesca da Rimini*.

RACINE, *ra seen'*, **JEAN BAPTISTE** (1639-1699), one of the foremost writers of poetic French drama. He was preëminently a tragedian, and the presentation, in 1667, of *Andromaque*, the first of his seven masterpieces of tragedy, was an event of great moment in the history of the French drama. Racine was born at La Ferté-Milon, and received a good education. The outstanding features of his college days were the religious impressions he received from pious Jansenist teachers and the thoroughness with which he studied the Greek classics. Sophocles and Euripides were to him the ideal dramatists. In 1662 he settled in Paris, was presented to the king, and became a poet of the fashionable element. At the same time, he formed friendships with Boileau, Molière, and other notables in the literary world.

In his later years, Racine refrained from writing for the stage, partly because he was incensed at the criticism of a hostile theatrical clique, and partly from religious motives. He was primarily a poet of the cultured and

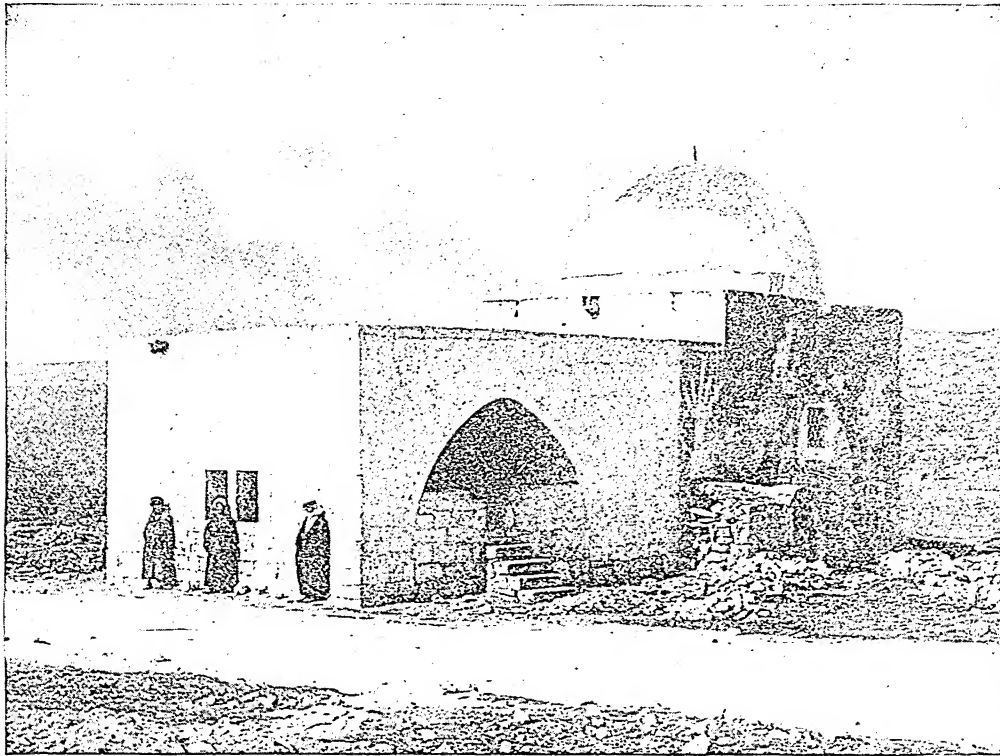


Photo: U & U

THE TOMB OF RACHEL

This historic spot is visited reverently by Jews, Christians, and Mohammedans. For an account of the life of Rachel, see page 5932.

fastidious; he never appealed to the masses. Although faithful to the strict dramatic conventions of his day, he produced plays of psychological keenness and great dramatic power.

Notable Works. Racine's great tragedies, *Andromaque*, *Britannicus*, *Bérénice*, *Bajazet*, *Mithridate*, *Iphigénie*, and *Phèdre*, were produced between 1667 and 1677. *Esther* and *Athalie*, two Biblical dramatic poems, were written several years later, but neither was publicly performed until after his death. R.T.H.

RACINE, WIS., the county seat of Racine County, is situated in the southeastern corner of the state, on Lake Michigan, at the mouth of the Root River. Next to Milwaukee, it is the leading manufacturing city in the state. It was founded in 1834, incorporated in 1843, and became a city in 1848. Population, 67,195 (1940).

Racine is one of the very few cities in the United States to have a Junior Police, under the direct supervision of the regular police department. These boys have equal power with the city police, and direct traffic past the schools whenever they are not in session. The junior police is under the merit system, and the captain and officers are chosen from the schools on the basis of scholarship and deportment.

Transportation. Racine is twenty-four miles south of Milwaukee and sixty-five miles north of Chicago, on the Chicago & North Western and the Chicago, Milwaukee, Saint Paul & Pacific railroads, and on the Milwaukee Electric Railway & Transport Company interurban. The city also has the advantage of a good harbor and motorbus and air line service.

Industry. Racine has 165 industries which annually produce \$125,000,000 of finished products, including farm implements, malted milk, automobiles, floor wax, books and playing cards, leather, shoes, and fractional horse-power devices. There are steam and electric railroads, and bus and truck lines. D.V.

RACK, an ancient instrument of torture, used to extort confessions from criminals and heretics. It was an oblong wooden frame with rollers on each end. Bound on this frame, the victim had questions put to him; if he remained stubborn and refused to answer, the rollers were gradually turned by means of levers, stretching the victim until the joints became dislocated.

The rack was used by the Romans, especially for torture of Christians, and was frequently employed during the Inquisition. Its use was introduced into England in 1447, but in 1628 its legality was contested, and the instrument fell into disuse.

RADCLIFFE, ANN. See HARVARD UNIVERSITY (Radcliffe College).

RADCLIFFE COLLEGE. See HARVARD UNIVERSITY, subhead.

RADIANT ENERGY. See LIGHT.

RADIATION. See HEAT (How Heat Travels).

RADICAL, in chemistry, two or more atoms forming a group which is capable of entering into a series of compounds without undergoing change. See CHEMISTRY.

RADICALISM, *rad' ih kah liz'm*, a term applied to the principles held by those who are opposed to conservative thought and action. It has been used in political terminology in England since the early part of the nineteenth century, but radicalism as a movement in English politics had its origin as early as 1769, in an effort to liberalize the House of Commons. At present, the British Labour party is considered a radical organization by the Conservatives, while the Labour party regards the Russian communists as the exponents of true radicalism. In the United States Senate, the term radical is often applied to the progressives, or insurgents, who were often in opposition to the regular Republicans through several administrations. In general, the name radicalism may be said to have a relative significance, for the radicals of one generation advocate the policies that the next generation accepts as a matter of course. Woman suffrage, the direct primary, and the initiative and referendum were all considered radical measures when first advocated. In world politics, the adherents of communism, or Bolshevism, best deserve this label. See BOLSHEVIKS; GOVERNMENT.

RADICAL SIGN. See SQUARE ROOT.

RADIOACTIVITY, *ra' dih o ak tiv' ih tie*, the spontaneous emission of rays capable of penetrating opaque substances. After the discovery of the X-ray, in 1895, physicists began experimenting with a number of substances to ascertain whether or not they possessed this remarkable form of energy, and in 1896 Henri Becquerel, a French scientist, discovered that the salts of uranium give off radiations that affect a photographic plate. The rays were named *Becquerel* rays, and the power of emitting them was called *radioactivity*. Two years later, Professor and Madame Curie announced their epoch-making discovery of an elementary substance which they found in pitchblende. The new element was named *radium*, because of its intense radioactive power. See RADIUM.

In the days of the alchemists, it was the dream of investigators to change the baser metals, such as lead, into gold. It became an accepted theory that one element cannot be changed into another, because each element is composed of characteristic indivisible atoms. Radioactivity refutes this theory. The atoms

in radioactive substances are constantly breaking up, and in the process, the disintegrating element changes into a different substance. Radium is the offspring, so to speak, of uranium; it is the sixth product in a long process of disintegration, lasting millions of years, a process that has been traced as far down as lead. There is another series in which the parent element is thorium, and a third series derived from actinium.

For many years radioactive changes observed in certain elements of high atomic weights resisted all efforts of scientists to alter them in the slightest degree. The highest temperatures and pressures available in our laboratories, the strongest acids and alkalis, nothing seemed to affect spontaneous radioactive processes. It was only when scientists began to bombard atoms with high-speed alpha and beta rays, and more recently with neutrons and deuterons, that artificial transformation or transmutation (including synthesis) of the elements became an established fact. Temporary radioactivity has been artificially produced in elements of low atomic weights in which no spontaneous radioactivity has been observed. See CHEMISTRY (Transmutation of Elements).

Three types of rays are emitted by radioactive substances, though not all of them are projected by every such substance. These rays have been named *alpha*, *beta*, and *gamma*, the first three letters of the Greek alphabet. Alpha rays are positively charged atoms of helium gas, moving with an average speed of about one-fifteenth that of light. They have low penetrating power. Beta rays are negatively charged electrons and are identical with cathode rays. Their velocities vary from about one-tenth to nearly that of light, and they are capable of penetrating several millimeters of aluminum. Gamma rays have practically the speed of light, or 186,300 miles per second in round numbers. They are not particles of matter, but are electromagnetic pulsations like X-rays, though of shorter wavelengths, and higher penetration. Cosmic rays are the only known type that exceed gamma rays in penetrating power.

A.L.F.

Related Subjects. Many other important and interesting facts related to radioactivity are told in the articles listed below:

Alchemy	Electricity
Atom	Marconi, Guglielmo
Cathode Rays	Matter
Chemistry	Millikan, R. A.
Cosmic Rays	Radium
Crookes Tubes	Roentgen Rays
Curie, Pierre and Marie	Uranium

RADIO CITY, that part of Rockefeller Center in New York City which touches on Sixth Avenue. Here is the seventy-story R.C.A. Building, in which are the studios of a broadcasting company; and the thirty-one story RKO Building of which Radio City Music Hall is an integral part. See illustration, page 4989.



R The STORY of RADIO

RADIO COMMUNICATION. The legendary account of the birth of Minerva, Roman goddess of wisdom—how she sprang full grown from the head of Jupiter, clad in shining armor and singing a song of triumph—reminds one of the advent of radio, so rapidly has it become a part of modern life. Early in the present century, the world began to be thrilled by stories of rescues at sea, made vivid by accounts of appeals for help carried far over the ocean waste, and of responses received from out the darkness and storm, almost as if thought were being transmitted through the air. The wireless telegraph, which made these rescues possible, had been a factor in world communication less than two decades when the wireless telephone proved its worth in the World War. In 1919 large numbers of American service men trained in radio telephony returned home to build sets of their own, and to introduce the sport of amateur broadcasting. In 1920 Harding's election to the Presidency of the United States was announced from America's first professional broadcasting station, KDKA; then, almost before one could realize it, radio telephony took the public by storm, and the night of the Presidential election of 1924, millions of listeners heard, in their own homes, the news of Coolidge's victory.

Radio is one of the most fascinating discoveries of all time. We are too close to its beginnings and development to have lost the feeling of wonder at the daily occurrence of instantaneous communication between far-distant points. Radio remains for us the eternal miracle, but it is none the less the expression, the out-

growth, of a very old desire. From earliest times, men have sought to carry on rapid communication with one another. Nearly 500 years before the Christian Era, a swift-footed runner, Pheidippides, carried the news of the victory of Marathon to the waiting Athenians. He ran twenty miles, gasped out his message, and fell dead. How many school children of a generation ago thrilled to the recital of that story! How many of them must have lived to read the daily reports of a dirigible that encircled the globe in 1929! To people in countless towns and cities the world over, the progress of the *Graf Zeppelin* was revealed at frequent intervals by radio, during the magnificent flight of twenty-one days (elapsed time).

Between the running Pheidippides, who died of exhaustion, and the radio apparatus of a globe-encircling airship, there is a tale of centuries of human effort to achieve rapid communication. We read in the *Iliad* of beacon fires kindled on successive mountain tops, to tell the Greeks that Troy had fallen. Signal towers on the Great Wall of China; relays of couriers, used by the Greeks and Romans; shouting sentinels of ancient Persia and of Gaul; flashes from Persian battle shields; smoke rings and fire arrows of the American Indians—these were some of the methods of communication adopted by peoples of long ago. Later came the elaborate signal systems of navies and armies, faster modes of transportation, and, in the nineteenth century, the telegraph and the telephone.

[Descriptions of these last-named devices, of such tremendous importance to-day, may be found in the articles TELEGRAPH and TELEPHONE.]



CALLING ALL CARS

Using short-wave radio the policeman can now talk back and forth between a patrol car and headquarters.

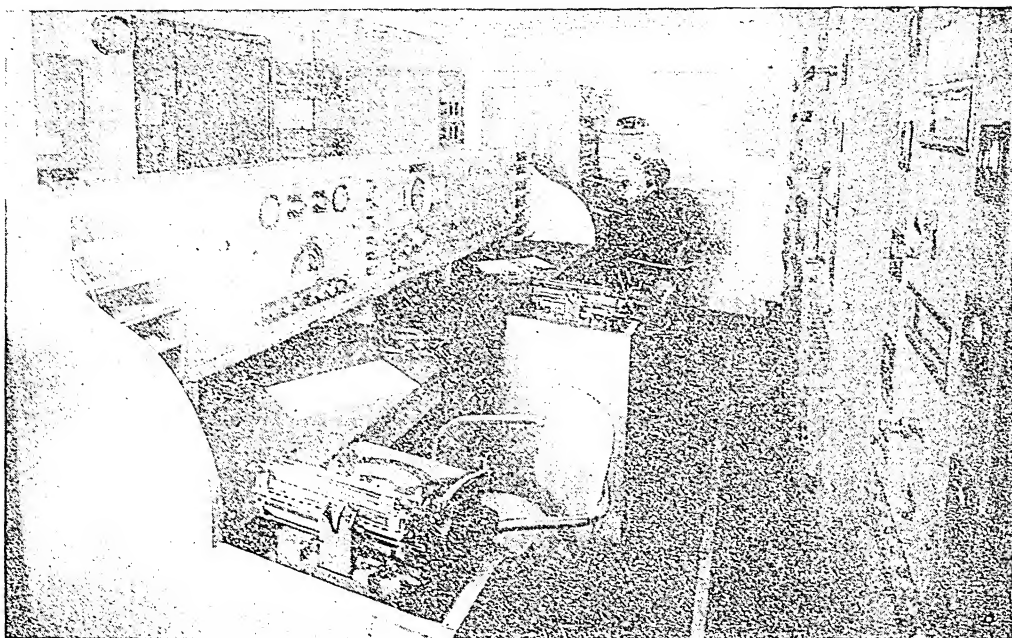


Photo: R. C. A.

RADIO INSTALLATION ON AN OCEAN LINER

The main radio room is equipped with five radio transmitters, five receivers, and one radio automatic alarm.

The Scientific Basis of Radio. Though radio is based on modern physics, the force that man is utilizing to conquer space has always existed. Like a sleeping giant, it lay dormant through the ages, awaiting the magic touch of scientific progress. In wireless communication, whether it be the telegraph or the telephone, the agency of transmission is the electromagnetic wave. All of the investigations in the field of electric and magnetic phenomena, preceding radio by many centuries, were necessary for the invention of practical wireless apparatus. The detailed story of those investigations is told elsewhere in these volumes (see *ELECTRICITY* and topics indexed therewith), but the basic principles of electromagnetism may be repeated here: namely, that electricity in motion produces a magnetic field, and a magnetic field in motion across an electric conductor produces an electromotive force. These principles were discovered and made known in the first half of the nineteenth century, during a period that also witnessed considerable investigation of light phenomena. These studies, too, belong to the story of radio.

At the opening of the century, Thomas Young (1773-1829), an English physicist, offered convincing proof of the wave theory of light—that it travels from luminous bodies in undulations similar to water waves. It is easy to visualize the series of widening circles that move outward from the point of disturbance when a stone is thrown into a pool.

Young demonstrated that light travels through space in some such manner, but, of course, by virtue of another medium than water. It is supposed that light waves are undulations of an elastic, all-pervading medium called the *ether*.

[Some scientists of to-day reject the theory of an ether, but the conception is a useful one, and the name is retained in the literature of physics as a matter of convenience.]

Referring again to our analogy of a pool, we must remember that the water particles themselves do not move outward, but up and down, each set of vibrations causing the water beyond to begin to vibrate. We have simply a transverse wave movement, with a series of crests and troughs. If we think of the distance between any two sets of crests as the length of the wave, and the number of crests passing a fixed point in one second as the frequency of the wave, it will be easy to understand the meanings of *wave-length* and *frequency*, as used in the terminology of radio telegraphy and telephony.

Nineteenth-century scientists accepted the wave theory of light with practical unanimity, and a brilliant mathematician and physicist of Edinburgh, James Clerk Maxwell (1831-1879), added to this conception by showing the connection between light and electromagnetism. In the later years of his life, he proved by mathematics that light consists of transverse

undulations of the medium that causes electric and magnetic phenomena, giving us the electromagnetic theory of light. He also predicted that it would be possible to propagate effects through space, in the form of electromagnetic waves, by means of electrical discharges.

About 1888 a German scientist, Heinrich Hertz (1857-1894), actually created such waves by means of a machine called an oscillator. In this device, two metallic plates, separated by two metallic spheres, are connected with the terminals of an induction coil. A small space between the spheres provides a spark gap. At each interruption of the primary circuit of the coil, the plates are energized to a point where there is a difference in potential sufficient to break down the insulation of the gap. As the electric current surges back and forth across the gap, millions of times a second, two oscillating fields, at right angles to each other, are produced in the region about the machine; one is an electric field, the other magnetic. Two such oscillating fields generate an electromagnetic wave, and a series of waves is produced as the vibrations continue.

These waves were detected by Hertz, in his original experiments, by means of a circular loop of wire containing a small spark gap. When he placed the loop in the plane of the electromagnetic waves, small sparks appeared in the gap of the wire. Hertz also demonstrated that the waves can be reflected, refracted,

in frequency. The shortest, which have the highest frequency, are the cosmic rays discovered by Robert A. Millikan. These have their origin in mysterious events occurring in the realms of outer space. Professor Millikan believes that they are heralds of creation,

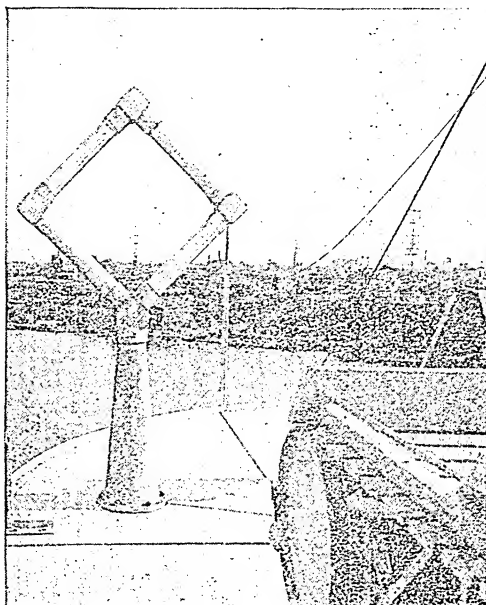


Photo: RCA

RADIO COMPASS

Deck view of radio direction finder, or radio compass.

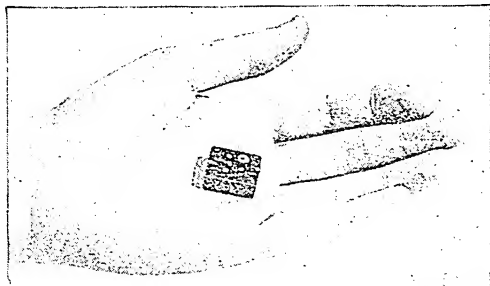


Photo: P & F.

SMALLEST RADIO SET

This receiving set easily fits into the palm of the hand and weighs only a few ounces. It was made in England, and excellent reception of programs was reported.

transmitted through insulators, and measured as to length and frequency. He showed that they differ from light waves only in length and frequency, and he opened the way to a series of experiments that made wireless communication a reality.

We know now that the Hertzian waves, as they are called, occupy one section of a vast scale of electromagnetic radiation, of which about seventy octaves have been identified. All of these rays travel with the speed of light, about 186,300 miles, or 300,000,000 meters, per second, but they differ in wave-length and

telling us of the formation of elements through the union of electrons and protons (see ELECTRICITY). Next in length are the gamma rays emitted by radium and other radioactive substances. These are messengers of disintegration, telling of the breaking up of atoms. Then come the better-known X-rays, then ultraviolet light, and then visible light. Between visible light and Hertzian waves are the infrared rays, which produce the sensation of heat. The Hertzian waves, which vary from a few feet to several miles in length, and whose vibrations usually do not exceed 30,000,000 per second, are the instruments of radio transmission. The slowest rate at which light waves are emitted is about 400,000,000,000,000 per second.

About four years after the successful Hertz experiment, described above, Sir William Crookes, in the London *Fortnightly Review*, made this interesting prediction:

Rays of lights will not pierce through a wall, nor, as we know only too well, through a London fog. But the electrical vibrations of a yard or more in wave-length . . . will easily pierce such mediums, which to them will be transparent. Here, then, is revealed the bewildering possibility of telegraphy without wires, posts, cables, or any of our present costly



Photo: Aemo

RADIO STATION AT PORT WASHINGTON, L. I.

Radio operators at airline bases establish contact at regular intervals with airplanes in flight, thus controlling traffic in the air. In case of trouble they help to locate airplanes and direct rescue parties.

appliances. Granted a few reasonable postulates, the whole thing comes well within the realms of possible fulfillment. At the present time, experimentalists are able to generate electrical waves of any desired wave-length from a few feet upward, and to keep up a succession of such waves radiating into space in all directions.

This is no mere dream of a visionary philosopher. All the requisites needed to bring it within the grasp of daily life are well within the possibilities of discovery, and are so reasonable and so clearly in the path of researches which are now being actively prosecuted in every capital of Europe that we may any day expect to hear that they have emerged from the realms of speculation into those of sober fact.

Many minds were at work on the problem of making the waves carriers of messages, but of special importance is the contribution of Edouard Branly, a French scientist of the Catholic University of Paris, who devised an improved apparatus for detecting Hertzian waves. In experiments begun in 1890, he demonstrated that these waves were capable of affecting metallic filings, causing them to cohere when the filings were placed in a glass tube and the tube made a part of an electric circuit. Sir Oliver Lodge carried on a valuable series of observations with the Branly coherer, or detector, in 1893-1894, and in 1895 Professor Popoff, a Russian, made use of it in apparatus for detecting electric waves at a distance. These and other investigations were all of ut-

most value to the young Italian scientist Marconi, who is honored as the inventor of the first practical instrument used in wireless telegraphy.

The devices used in both radio telegraphy and radio telephony are explained in detail in another section of this article, but it will be interesting at this point to know how the electromagnetic wave, which in everyday experience is an intangible, unknowable thing, can be used as the carrier of sound. In all radio communication, we must have transmitting and receiving apparatus. The transmitter, generally speaking, consists chiefly of apparatus for generating high-frequency alternating currents; and an antenna, or aerial, which, when fed by these currents, radiates electromagnetic waves into space. In the case of ordinary radio telegraphy, a key is used to stop and start the currents, resulting in the transmission of waves that reproduce the dots and dashes of the international code.

Radio telephony requires somewhat different apparatus, for the ear must perceive the modifications that correspond to spoken words, music, and other natural sounds. In brief, then, the sounds of voices or instruments at the transmitting end are caught by a microphone. This reproduces, in the form of electrical pressure, the variations of air pressure made by the sound waves. Wires carry these

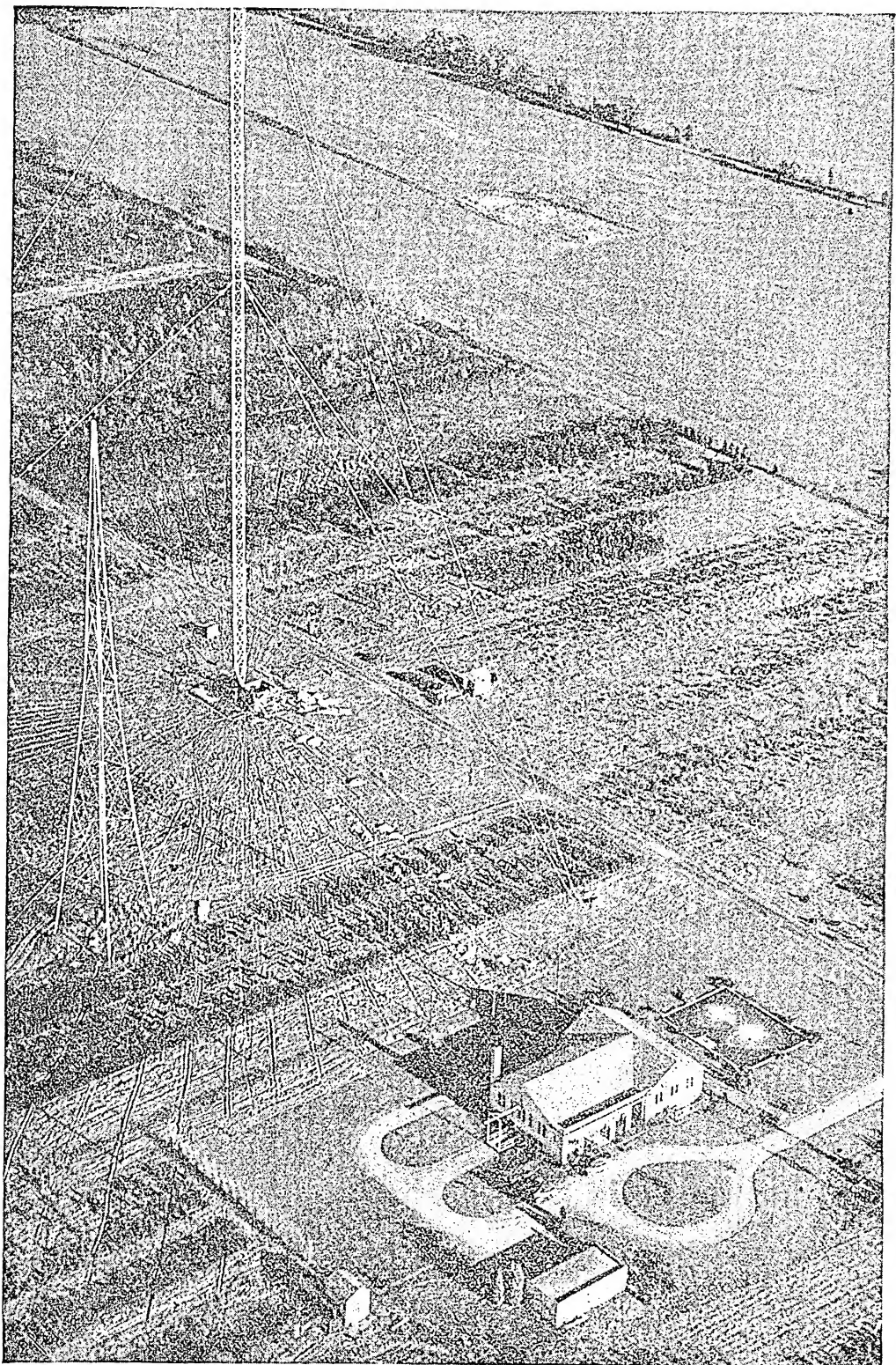


Photo: U & U

Gateway to the Ether. At the left, WRCA, shortwave antenna of the NBC at Bound Brook, N. J., from which programs are beamed to foreign lands. At the right, WJZ antenna.

impulses to apparatus that transforms them into electromagnetic waves. The latter are radiated through the ether, as explained above, are collected by the antenna of the receiving apparatus, and are transformed back into electric impulses. A receiver or loud speaker then converts the electric signals into sounds that the ear translates as words, musical tones, etc.

In listening to the sounds from a first-class receiving set, we are amazed at the naturalness of what we hear. Indeed, we are sometimes unable to distinguish between the voices of persons in an adjoining room and voices coming to us from a loud speaker in that room. Actually, of course, we hear a translation of the



Photo: NBS

SMALLEST MICRO-WAVE TRANSMITTER

The transmitter held in the engineer's hand operates on wave lengths of one meter or less, at a power of .2 watt. Also shown are the special pocket-size batteries and the tiny "acorn tube" used in the set. The engineer who holds the transmitter directed the research and experiment which developed it.

sounds. Another interesting point is the fact of instantaneous reception, for our electromagnetic carriers are everywhere traveling at the rate of 186,300 miles a second. While a lecturer is speaking, the persons in the hall do not actually hear his words until after they have reached the ears of radio listeners, hundreds or thousands of miles away. The sound waves travel to the audience in the hall at the rate of about 1,100 feet per second. The radio wave travels with the swiftness of light, which, as we know, is a velocity that would carry a ray completely around the globe about seven times in one second.

Radio in Modern Life. The wireless telegraph has played its part in world affairs since about 1898. In 1896 Marconi conducted a series of successful experiments with his apparatus in England, and also made his first application for a British patent. Continuing his experiments, he was able constantly to widen the distance between the transmitting and receiving stations, and in July, 1898, reports of yacht races off Ireland were transmitted to the newspapers, marking the first use of wireless for news dispatches. In December, 1901, the letter "S" was transmitted from Cornwall in England and received in Newfoundland. The following February, test-letter signals were received by a steamer at a distance of 2,099 miles from the Cornish coast, and on December 19, 1902, the Atlantic was spanned for the first time by actual radio messages.

From these beginnings, radio telegraphy has firmly established itself as the principal means of communication between ships at sea and between ships and shore, while a multitude of stations on land serve to make the world a neighborhood of communicating nations. The use of radio telegraphy has been standardized by international agreement and nearly all civilized governments have made the installation of wireless on passenger-carrying vessels at sea compulsory. Such a law was passed by the United States in 1910, and in 1911 a radio division of the Department of Commerce was organized to administer the law. In 1932 the duties of the division were transferred to the Federal Radio Commission, which was succeeded by the Federal Communications Commission in 1934. The letters S O S were adopted by all the nations, to serve as a call for help, anywhere on the seas. It is an inviolable law of the sea that any vessel receiving this signal shall render assistance as quickly as possible. Travel on water is also made safer by the use of radio fog-signal stations, now operated in connection with the life-saving service of every nation. We also have the radio compass, a device that enables a navigator to locate other vessels or to determine the position of his ship with reference to land.

Because of its reliability and reasonable cost, trans-oceanic wireless has taken over a considerable part of the business formerly done by cable, and has been instrumental in lowering the cost of sending messages by cable. The wire telegraph will always have its place on land, but for communication between widely separated points, and in regions where wire installation is impracticable, wireless is indispensable, and it has been of incalculable value to trade and commerce.

The World War brought about an intensive development of all types of radio apparatus, and wireless became the outstanding method of communication, not only in the military

field but between zones of operation and the outside world. Radio telephony shared in this development, and was especially valuable as an adjunct to the airplane service. Before the war ended, an occupant of a plane was able to send spoken messages to an operator on the ground, from a height of two miles. Radio telephony as we know it to-day owes much to a delicate instrument invented by Lee De-Forest—the three-electrode audion. Engineers of the Bell Telephone Laboratories and of the General Electric Company, working in the one case to devise a telephone repeater, and in the other to discover improved apparatus for X-ray and power purposes, developed the audion into the high-vacuum tube of the modern radio set. Since 1915 when Bell engineers proved radio telephony practicable, services have been installed covering thousands of miles, the London-Cape Town and the United States-Hawaii services being among the longest.

The radio telephone did not, and probably never will, replace the ordinary telephone for personal and business communication. The limited number of air channels, the need for privacy in message-sending, and the cost of wireless-telephone apparatus, all tend to maintain the older type of telephone in its present supremacy. But just because radio telephony lacks the element of secrecy, it is an incomparable agency for broadcasting. All over the world to-day, but especially in America, listeners in their homes are hearing musical programs, church services, descriptions of sports, market reports, news of the day, weather predictions, lectures, educational talks, and so on, by virtue of radio telephony. This has become so deeply entrenched in our thought and interest that the name "radio" has come to be associated, mainly, with broadcasting and its paraphernalia.

In the United States there are more than 900 licensed broadcasting stations; about 300 are

owned by newspapers. When an event of unusual importance is broadcast, as many as 400 stations may be linked together in a single hook-up. Chains of twenty to eighty stations are not uncommon. The radio-receiving equipment sold in the United States in a recent typical year had a market value of about half a billion dollars. The total number of stations in all other countries is about five hundred and fifty. In Great Britain the government has control of radio programs, but there are

no restrictions on broadcasting in the United States, nor are owners of radio sets required to pay license fees, as in Great Britain and nearly all other countries. These fees vary from \$2.50 to \$20 a year. Originally, the American broadcasting stations considered that they received an adequate return through the publicity and good will accruing from their activities, but it is customary now to "sell time" to manufacturers and others desiring to take advantage of the widespread advertising facilities of radio.

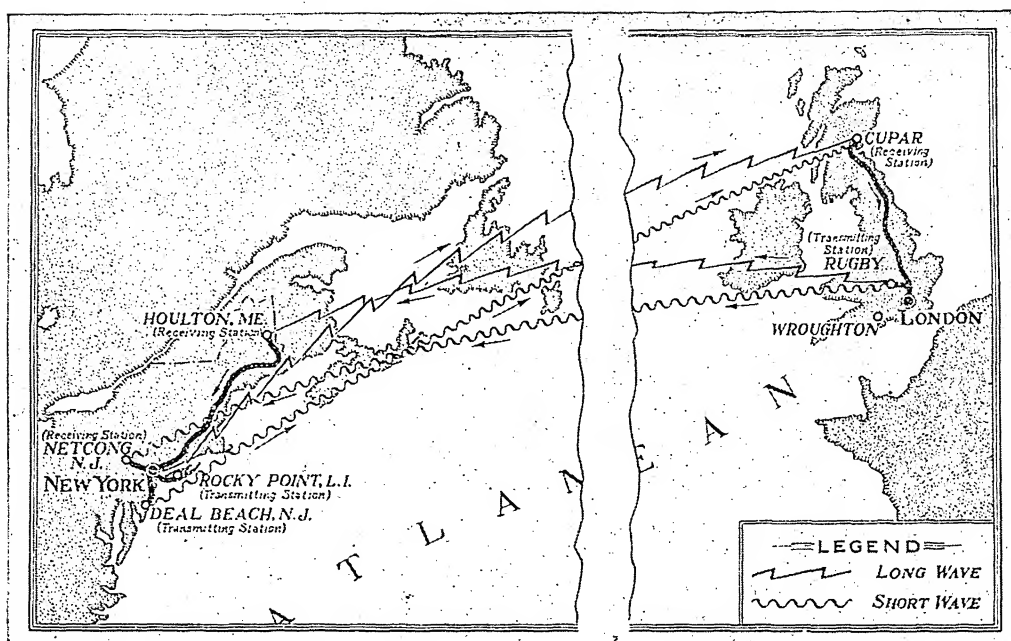
The rapid development of

broadcasting led to such chaotic conditions in the channels of the air that Congress took action, in 1927, by enacting a law providing for the creation of a Federal Radio Commission of five members. The Commission was vested with authority to grant licenses, and to fix wave-lengths and hours of operation. For the purpose of allocation, the country was divided into five zones, based on population. In 1928 the act was amended, in order to permit the Commission to carry out a needed revision of the allocation of wave-lengths. The number of air channels is divided equally among the five zones, and these channels are classified for rural, regional, and local service. Stations in the latter class are limited to 100 watts; those in the regional to 1,000 watts. Some of the difficulty of overcrowding was overcome by the dividing of time between stations, but stations must not depart from assigned frequencies, under penalty of having their licenses revoked. In February,



MODERN-STYLE RADIO CABINET

This receiver includes the "magic" eye, three-band dial, push-button switch, and "plug-in" for phonograph records.



RADIO ACROSS THE ATLANTIC OCEAN

As this map shows, two-way conversation across the Atlantic goes by widely different routes. Eastbound the voice travels from Rocky Point, Long Island, to Cupar, in the north of Scotland, thence by wire lines to London and to the Continent. The east-to-west voice goes from London to Rugby, England, by wire, thence by radio to Houlton, Me., where again the voice currents are placed upon wires and carried to New York. A particular type of antenna, called a "wave" antenna, is used to pick up the waves after their long journey across the North Atlantic. This antenna is about four miles long and, to the layman, appears to be an ordinary telephone line. However, it functions in a very particular way as regards the radio signals which it receives.

1929, the Commission began to function as an appeal board for the Department of Commerce; in June, 1934, its functions were taken over by the Federal Communications Commission.

Other Developments. In 1927 trans-Atlantic radio telephony was established on a commercial basis, between New York and London, and the system has since been extended to include other large centers in Great Britain and on the Continent, besides Ceuta, in Morocco. There are three complete channels for trans-Atlantic telephony. The next development will be a telephone cable between America and England. In 1928 the Radiomarine Corporation of America was organized as a subsidiary of the Radio Corporation of America, for the purpose of transmitting telegraph messages to and from persons on board ship. The service is furnished by seven transmitting stations along the Atlantic and Gulf coasts, two on the Pacific coast, and four on the Great Lakes. The station at Chatham, Mass., is one of the most powerful marine stations in the world. It is able to keep in touch with ships all the way across the Atlantic.

Special weather service by radio for aviators was initiated in 1928 by the United States Weather Bureau. The service begins at 8:15

A.M., one-half hour after the weather stations file their observations, and reports are mapped by aerologists at aviation fields by 9:30 A.M., one hour in advance of the regular weather-report releases. Aviators are thus able to start their flights with complete weather information early in the day, and are able to select routes that avoid adverse weather conditions. Previous to the establishment of a special meteorological service by radio, officials in charge of government aviation units complained that weather reports broadcast at 10:30 A.M. did not contain sufficient information for the planning of flights, and were received so late in the day that aviators were already on their journeys. As they departed without adequate data on atmospheric conditions, forced landings were frequent, and courses of flight often had to be changed. The reports are sent out from Washington, D. C., and from a branch office in San Francisco, Calif.

Radio telephoning to and from aircraft is being adopted as rapidly as possible by commercial air-transport companies. Because the spoken word gives a message so much more quickly than the code signal, it is realized that air travel can be made much safer by use of

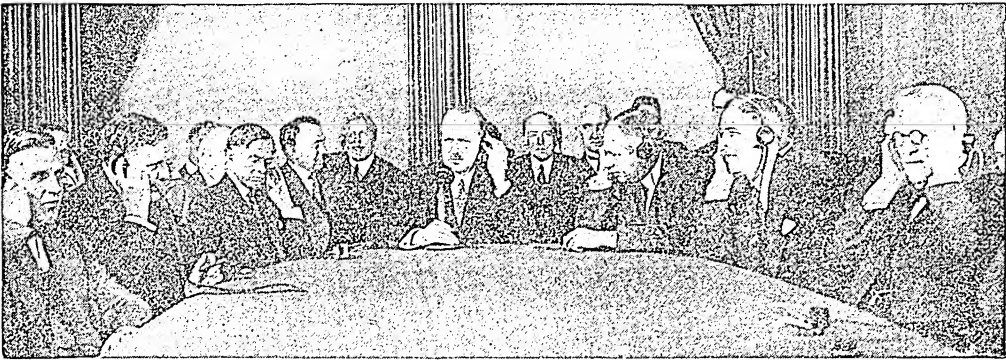


Photo: U & U

THE FIRST MESSAGE OVER THE TRANS-ATLANTIC RADIO TELEPHONE

The date was January 7, 1927. The scene was photographed in the office of the American Telegraph and Telephone Company, that a permanent record might be preserved of the epochal event. The president of the company is seated in the center, and on either side are other telephone officials.

radio-telephone apparatus. Radio telephony is also being used for communication between moving trains and ships. A novel and effective method of fighting forest fires has been developed, which makes use of radiophones. An observer flies above the forest in an airplane and directs the fighters in the woods below by radio. Each group of fighters carries a portable

receiving set. Television, and the application of radio principles to talking moving pictures and to the transmission of news, photographs, documents, signatures, etc., are other interesting developments of this great discovery of our modern age (see *Related Topics*, at the end of this article; and the sections following, describing radio apparatus). B.M.W. and O.E.D.Jr.

The Apparatus for Radio Telegraphy

Damp-Wave Transmitting Apparatus. Radio transmitters are divided into two classes, according to the form of wave which they emit. The first type is called a damp-wave or spark transmitter, and the second an un-

damp-wave or continuous-wave transmitter. Damp waves are conveniently produced by an electric spark. An apparatus for this purpose may consist of an induction coil, battery, key, and spark gap. When the key is pressed, electric current from the secondary winding of the induction coil jumps across the gap, and the sudden starting and stopping of this current shocks the ether into vibration. The vibrations are very feeble, however, unless additional apparatus is used. Much stronger impulses are set up if one side of the gap is connected to an elevated wire, and the other to the ground (Fig. 1). If a condenser and a few turns of heavy wire are added, as shown in Fig. 3, powerful waves can be obtained which may be detected at a considerable distance. An efficient spark transmitter (see Fig. 3) usually has a transformer in place of the induction coil. This permits the use of greater power, since alternating current from a power generator can be utilized. The simple spark gap is often replaced by a motor-driven wheel called a rotary gap, or by a quenched gap, which consists of several metal discs mounted parallel

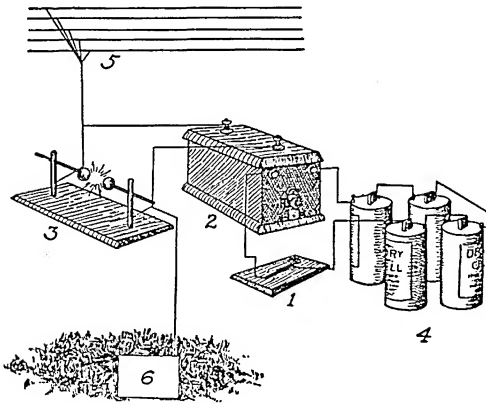


FIG. 1. SIMPLEST PRACTICAL TRANSMITTER

1, key; 2, induction coil; 3, spark gap; 4, battery; 5, aerial; 6, copper plate in ground.

damp- or continuous-wave transmitter. The two types of waves are distinguished simply by the fact that, in a series of damp waves, each successive one is weaker or of less amplitude than the preceding (see Fig. 5, A), while in a series of undamp vibrations, all are of exactly the same amplitude (see Fig. 12, A).

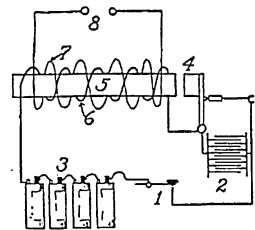


FIG. 2. INDUCTION COIL

1, key; 2, condenser; 3, battery; 4, interrupter; 5, core; 6, primary; 7, secondary; 8, spark gap.

and very close together, separated by insulating washers.

The production of damp waves by the apparatus shown in Fig. 3 may be explained as follows: Electric current from the induction coil

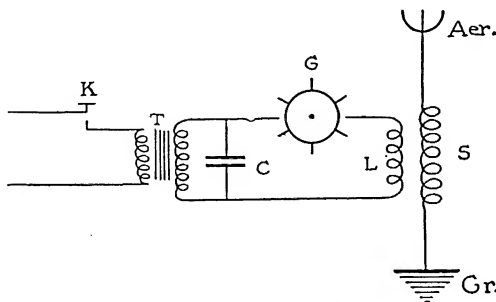


FIG. 3. SPARK TRANSMITTER

K, key; T, transformer; C, condenser; G, rotary spark gap; LS, oscillation transformer; Aer, aerial; Gr, ground.

or transformer charges the condenser (C), which immediately discharges across the gap (G) in the form of a spark. The passage of this current ionizes (see ION) the air in the space between the metal parts of the gap, and very greatly lowers its resistance. The current continues to rush across until the condenser is fully charged oppositely; that is, the part which was positive has become negative. A discharge now occurs backward through the gap, and the condenser becomes charged, as at the start.

This action is analogous to that of a pendulum which swings past its lowest position, rises to a height nearly as great as that from which it started, and then reverses its motion. The charging and discharging of the condenser continues for a brief time, but each successive rush of current is weaker, because of the loss of energy in the form of heat. As a result, the charge soon becomes too feeble to jump the

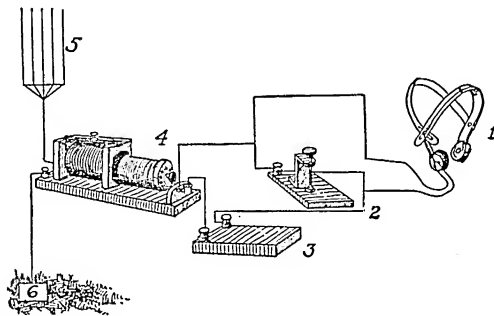


FIG. 4. RECEIVING APPARATUS

1, receivers for ears; 2, detector; 3, fixed condenser; 4, loose coupler; 5, aerial; 6, copper plate in ground.

gap, and the wave-train comes to an end. There is then an interval of time when no waves are sent out. When the condenser gets

a fresh charge from the transformer, the whole cycle is repeated. There will be one wave-train or group for each reversal of the current in the transformer. In case an induction coil is used, there will be one group of waves for each break of the circuit by the interrupter, but if a rotary gap is used, the number of sparks, and consequently the number of wave-trains, may be increased to several hundred per second. The time during which the current oscillates across the gap is very small compared to the intervals between wave-trains. For example, if a transmitter sends out 500 groups per second and the length of each wave is 600 meters, the interval between successive groups of waves is $\frac{1}{500}$ second, while the time each group persists is only $\frac{1}{25000}$ second.

The frequency (N) of the electric oscillations in the circuit, which consists of the condenser (C), gap (G), and inductance coil (L) (Fig. 3), depends upon the capacity of the condenser and the inductance of the coil. The relation between them is given by the equation $N = \frac{1}{2\pi\sqrt{LC}}$. If either the capacity or inductance is increased, the frequency becomes less, and if either is decreased, it becomes larger. However, both capacity and inductance may be changed without changing the frequency, provided their product remains constant.

The oscillations of current in the primary or closed circuit induce similar oscillations in the aerial circuit, which consists of the coil (S), the aerial wires, and the ground. If the transmitter is properly adjusted, the induced currents will have the same frequency as those in the primary circuit.

The wave-length of any vibration can be found by dividing its speed by the number per second. In case of electromagnetic waves, the speed is 186,300 miles, or 300,000,000 meters, per second. If a transmitter is adjusted so that the oscillations of current take place at the rate of 1,000,000 per second, then the wave-length of the radiated waves would be 300,000,000 divided by 1,000,000, or 300, number of meters. The frequencies most commonly used in radio communication range from 15,000 to 30,000,000, and the corresponding wave-lengths vary from 20,000 meters to 10 meters.

Damp-Wave Receiving Apparatus. A simple outfit for receiving signals from a spark transmitter consists of an aerial, tuning coil, detector, and telephone receiver. The action is as follows: Electromagnetic vibrations which are sent out from a transmitting station cause very rapid electric impulses to flow back and forth between the aerial wires and the ground through the tuning coil. These currents alternate so rapidly that a telephone cannot respond to them. However, if a detector is placed in the circuit, as shown in Fig. 4, No. 2, current can flow only in one direction. The action of the detector is illustrated in Fig. 5.

The currents in the tuning coil occur in groups, just as do the ether waves which cause them. The detector allows half of each alternating pulse to go through it, so that several current pulses flow in one direction through the telephone receiver, each time a wave-train arrives. The series of direct-current pulses resulting from each wave-train combine to produce a single pull upon the metal diaphragm of the telephone. During the interval before the next group of waves arrives, the diaphragm springs out to its normal position, so the sound produced in the telephone is a musical note which has one vibration for each wave-train in the transmitted message.

Tuning the Receiver. To tune the receiving set to the wave-length used by some particular transmitter, the inductance of the tuning coil is changed, usually by varying the number of turns of wire upon it, or the capacity of one or more condensers may be varied (see Figs.

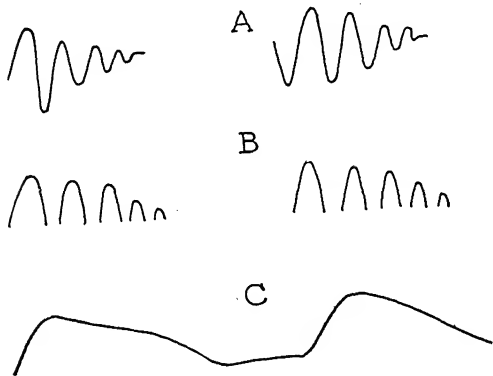


FIG. 5. DAMPT WAVES

A, diagrams of two wave trains; B, wave trains modified by the detector; C, curve showing rise and fall of current in the telephone receiver.

8, 11). These adjustments are so made that the signals reach their maximum strength. The tuning is said to be *sharp* when the adjustments mentioned have to be carefully made in order to receive a given signal. The tuning is *broad* if the inductance and capacity may have a wide range of values and yet allow the signal to be heard.

The sharpness of the tuning depends largely upon the degree of damping; that is, the rapidity with which the oscillations in a wave-train die away, or, in other words, upon the number of individual waves in each group. If the damping is large, which means that the number of oscillations per wave-train is small, the tuning will be broad. On the other hand, if the damping is small, the tuning will be sharp in the receiver. The degree of damping, and consequently the sharpness of tuning, is determined by the type and adjustment of the transmitter. The advantage of sharp tuning is that interfer-

ence, or mixing up of signals from different stations, can be largely avoided.

Detectors. Several types of detectors have been used in receiving wireless messages. The earliest type used, called a *coherer* (Fig. 6),

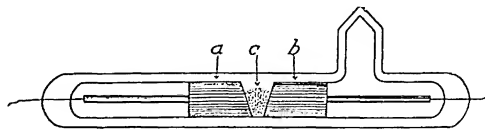


FIG. 6. COHERER

A, electrode; B, electrode; C, filings.

consists of a hollow glass tube containing metal filings loosely held between solid-metal rods, which are slipped into the glass tube. Electromagnetic waves cause the filings to cohere, or stick together, and the resistance is lowered. A battery then causes current to flow through the coherer and operate an electric bell. A tapper is provided which shakes the tube and loosens the filings during the intervals between groups of waves. This detector is not very sensitive, and is seldom used.

The simplest detector now in common use consists of a crystal of some mineral such as carborundum, silicon, or galena, and a pointed metal rod or wire which touches the surface of the crystal (see Fig. 4, No. 2). The crystal permits electric current to flow through it in one direction, but not in the reverse direction. The result is that the rapidly alternating currents in the receiving apparatus are detected or rectified, as previously explained.

The Audion, or Triode. The most sensitive and widely used detector is the *triode* (see Fig. 7). This is a glass tube in which are mounted three metal parts—the filament, plate, and grid. Wires pass through the glass and connect with each of these parts. The air is carefully pumped out, and on that account it is often called a vacuum tube. Because of the revolutionary effect its use has had upon radio communication, and also because of its wide usefulness in many other lines, the triode is regarded as one of the most important inventions of the twentieth century. The pioneer discovery upon which the development of the triode was based was made by

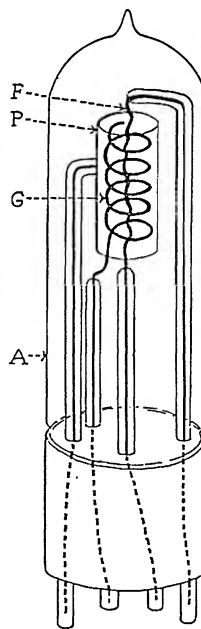


FIG. 7. TRIODE

A, glass tube; F, filament; G, grid; P, plate.

Thomas A. Edison. He found that a metal plate inserted into an electric-light bulb became negatively charged when the filament was lighted. J. A. Fleming of England was the first to make use of a vacuum tube, constructed in this manner, as a radio detector. Dr. Lee De Forest in 1906 vastly improved the sensitiveness of the vacuum tube as a detector of electromagnetic waves by making use of a third element, known as a grid. This is usually a spiral of wire or a cylinder of metal perforated with holes, which surrounds the filament.

Vacuum-Tube Receiver. A receiving circuit containing a triode is shown in Fig. 8. The filament is heated by current from a battery (A), and the plate is made electrically positive by a battery (B), which is connected between it and one terminal of the filament. Under these conditions, vast numbers of tiny negative electric charges, or electrons, escape from the heated filament and fly across the vacuum

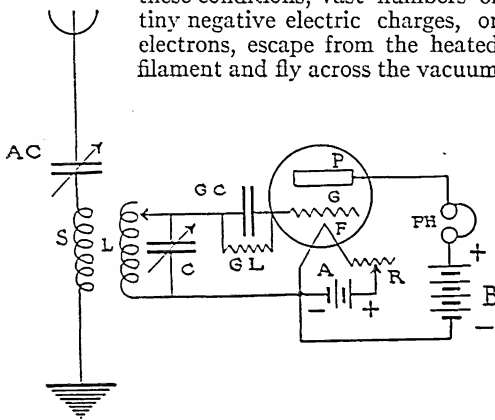


FIG. 8. TRIODE RECEIVER

AC, aerial tuning condenser; S L, loose coupler (tuning coils); C, variable condenser; GL, grid leak; G, grid; P, plate; A, filament battery; B, plate battery; F, filament; PH, telephones.

space to the plate and flow through the battery (B) and the telephone receiver. This steady current does not affect the telephones until its rate of flow is changed by the action of the grid. This happens when high-frequency currents are set up in the circuit L C, by induction from the aerial circuit A C S. The rush of current back and forth gives the grid alternate positive and negative charges. When the grid is positive, electrons are attracted to it from the heated filament, and are prevented from escaping by the condenser (G C). When the grid has a negative charge, no electrons can reach it because of its repelling action. Thus the grid soon becomes strongly negative, and not only repels electrons from itself, but prevents them from going past it to the plate. Consequently, the current through the telephones suddenly ceases. During the intervals between groups of oscillations, the negative charge on the grid leaks off through the con-

denser (G C), or through a high resistance (G L) called a grid leak, which is connected in parallel with the condenser. The electronic current from the filament to the plate immediately starts again, and is registered by a click in the telephones.

There is one click in the telephones for each wave-train in the signal, and the musical note which results will have the same number of vibrations per second as there are wave-trains in the message received. From this it is evident that each spark transmitter has its own characteristic tone. It should be clearly noted that the current which operates the telephones is furnished by the battery (B), and that the triode acts merely as a very delicate trigger, or relay, to start and stop this current.

Undampt-Wave Transmitters. Undampt ether waves may be produced by three different types of transmitting apparatus. The first is the *high-frequency generator*. This is a large machine, similar in many ways to the electric generators used in city power plants for producing low-frequency alternating current. Several of the high-powered radio stations of the world are equipped with generators of this kind.

The Arc. The second type is the Poulsen arc transmitter (see Fig. 9). In its simplest form, it consists of a carbon and a copper rod between which direct current from a generator passes in the form of an arc. The arc terminals are shunted by a circuit consisting of a condenser and an inductance coil. The aerial and ground may be connected to the secondary of a loose-coupler, as shown in the figure, or con-

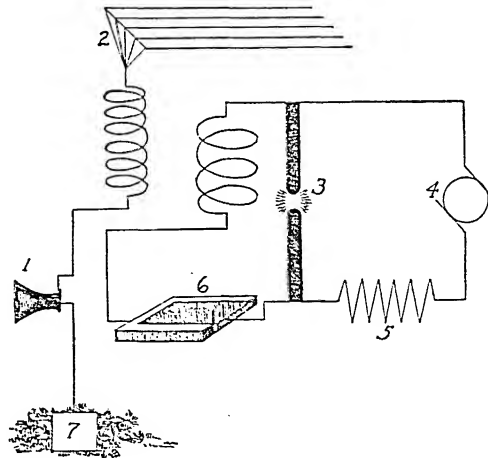
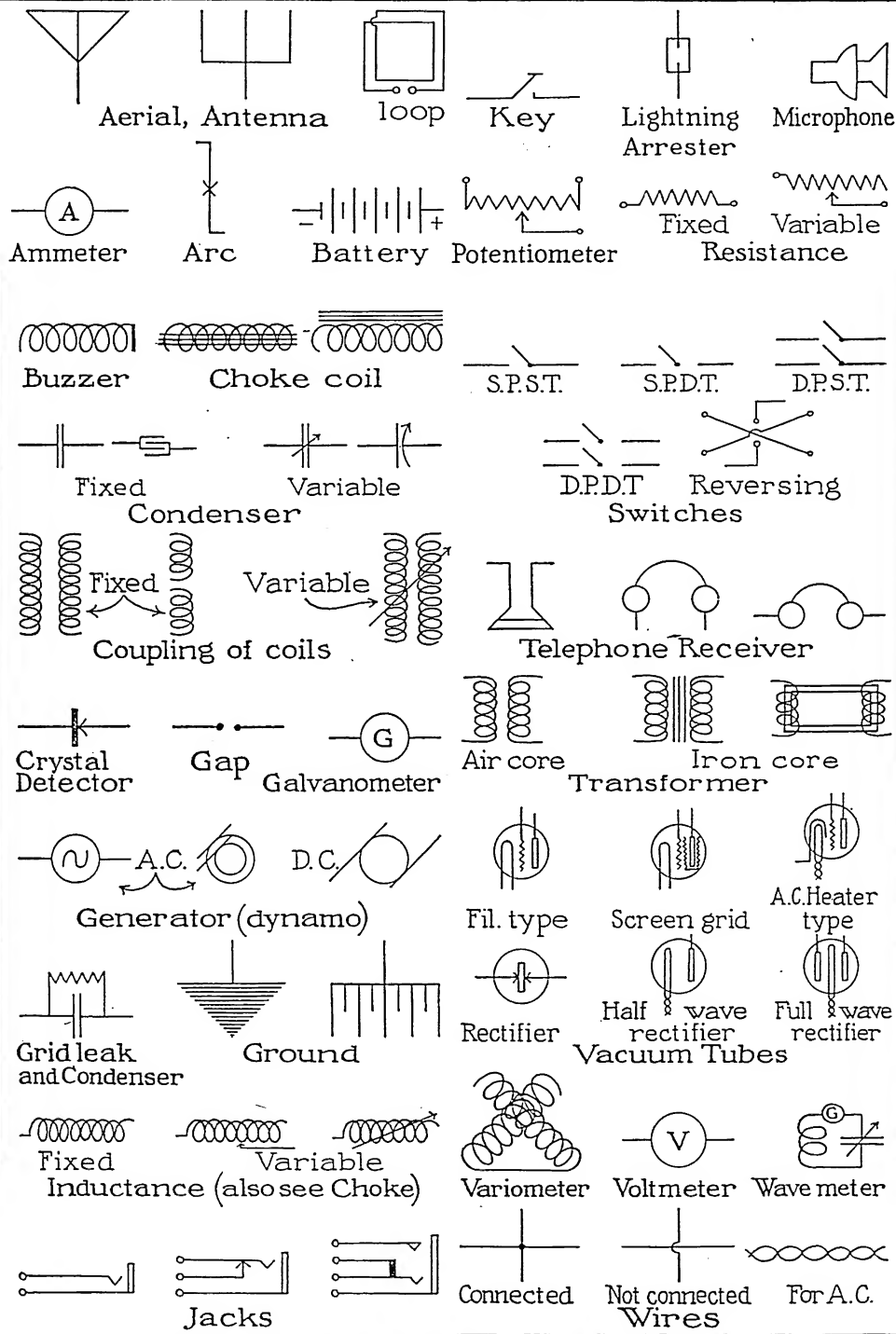


FIG. 9. TRANSMITTING SYSTEM

1, telephone transmitter; 2, aerial; 3, arc; 4, dynamo; 5, reactance; 6, condenser; 7, copper plate in ground.

nected directly to the arc. In the latter case, the coil is placed in series with the aerial, and the capacity between the aerial wires and the

SYMBOLS USED in RADIO



ground serves as a condenser. During the operation of the arc, oscillations are set up in the condenser circuit, with a frequency which

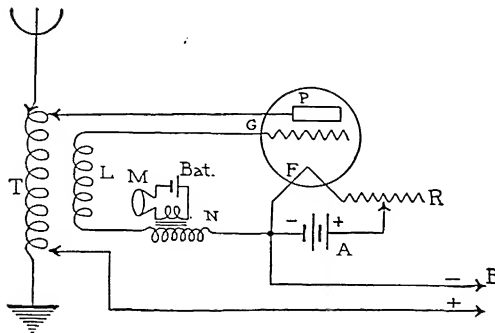


FIG. 10. VACUUM TUBE TRANSMITTER

T, tuning coil; L, grid coil; M, microphone; N, telephone transformer; Bat., battery. (Other symbols as in Fig. 8.)

depends upon the values of capacity and inductance used. These oscillations, which are all equal, cause undamp't electromagnetic

waves to be radiated from the aerial. Arc transmitters are used by many high-powered radio stations.

Vacuum-Tube Oscillator. The third type of continuous-wave transmitter is the triode, or vacuum tube. The tubes used for this purpose are usually larger and more rugged than those which are used in receiving apparatus. A simple transmitting circuit is shown in Fig. 10. Its action may be briefly stated as follows:

Electrons from the heated filament fly through the vacuum space to the plate, and flow through coil T to the battery or generator and back to the filament. The sudden starting of this current causes a reverse current to be induced in coil L, which is attached to the grid of the tube. The grid becomes negative, and by its repelling force stops the flow of electrons from the filament to the plate. This sudden stopping of the current in coil T causes a current to be induced in coil L in such a direction as to make the grid positive. The flow from filament to plate then starts again. This cycle is repeated indefinitely, and the oscillations of the current produce undamp't ether waves which are sent out from the aerial.

Apparatus for Radio Telephony

The Transmitter. Any transmitter of undamp't waves may be used as a radiophone transmitter, by aid of some device for modulating the waves. The type of apparatus needed for this depends upon the kind of

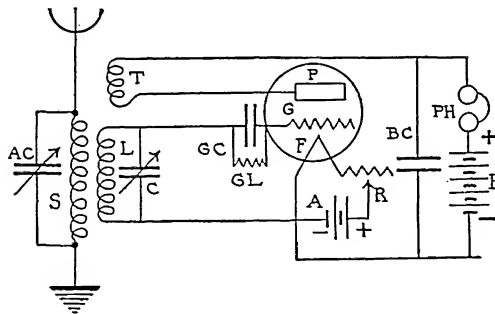


FIG. 11. REGENERATIVE TRIODE RECEIVER

BC, bridging condenser; T, tickler coil. (Other symbols as in Fig. 8.)

transmitter used. A crude method of modulating the current in an arc transmitter is shown in Fig. 9. A carbon microphone is inserted into the aerial-ground circuit, so that the oscillating current produced by the transmitter has to pass through it. When the diaphragm of the microphone is pushed inward by a sound vibration, the carbon granules within the microphone are packed closely together, and the resistance is lowered. When the diaphragm flies back to its normal position, the carbon granules become loose and offer a large resistance to the passage of current.

Since the amount of oscillating current which can pass through the microphone is controlled by the resistance of the latter, the amplitude or strength of the transmitted waves must vary. Fig. 12 is an illustration of the manner in which the ether waves are affected by the movements of the diaphragm of the microphone. A is a diagram of a series of undamp't waves; B shows the same series of waves when influenced by a telephone transmitter. The waves are no longer alike, but have widely different amplitudes. This effect is called modulation.

A much more effective device for modulating radio waves by the voice is the magnetic modulator, a simple form of which is shown in Fig. 13. Two coils of wire, A and B, are wound on a large iron frame. Coil A is connected directly to the aerial-ground circuit of an arc or generator transmitter, and coil B is connected to a battery and microphone. When the microphone is disturbed by sound waves, pulsing currents flow in coil B. This current magnetizes the iron and changes the reactance or effective resistance of coil A. When this has a high value, nearly all of the current from the transmitter flows into the aerial-ground circuit, but when the reactance is low, most of the current flows through A, and very little remains to affect the aerial. Hence the amplitude of the aerial currents, and consequently of the ether waves which are radiated, changes with every variation of the operator's voice.

Vacuum-tube transmitting sets are more widely used for telephony than any other type, because of their low cost and high efficiency. This is the type used by amateurs and broadcasting stations. Fig. 10 shows one method of modulating the continuous waves from such a transmitter. Electric currents which are varied by the microphone (M) flow in the primary winding of a small transformer (N). The secondary winding forms a part of the grid circuit of the vacuum tube. Each variation of the current in the primary causes fluctuating current to flow in the secondary of the transformer, and thus varies the charge on the grid. The grid in turn controls the current flowing in the plate circuit, which is connected to the aerial. The transmitted waves are accordingly varied in amplitude, or modulated, by the sounds which fall upon the diaphragm of the microphone.

Broadcast Transmitter. Another and more efficient method of modulating the waves from a triode oscillator is shown in Fig. 14. The microphone and transformer are connected to a modulator tube (MT), which is the same size as the oscillator (OT). The plate current of the modulator tube is controlled by the

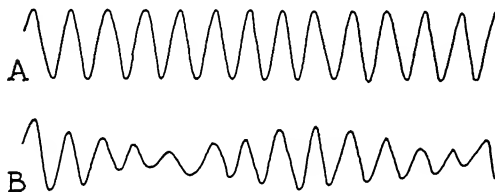


FIG. 12

A, diagram of undamp't waves; B, diagram of modulated waves.

variations of the current through the microphone, as explained above. Both modulator and oscillator tubes are connected to the same source of direct current, and the total amount of power available remains constant. Hence, if one tube draws a large current, the other gets very little. The oscillating current in coil L is strong when the current through the modulator tube is small, and feeble when the latter is large. The waves which are caused in the ether by the oscillations in coil L must therefore vary in amplitude as these currents fluctuate. This system of modulation is widely used by broadcasting stations. If greater power is desired, several oscillator tubes and an equal number of modulator tubes may be used. It is customary to use alternating current to light the filaments of all the triodes of a transmitting set, but a battery may be used for that purpose, as shown in the diagram. The high-voltage direct current supplied to the triodes is usually furnished by a generator.

Undamp't-Wave Receiver. The usual method of receiving undamp't-wave signals is to use

a vacuum-tube circuit which will oscillate. A common form (one of the Armstrong regenerative circuits) is shown in Fig. 11 (for explanation, see above, *Vacuum-Tube Oscillator*). The waves from a distant transmitting station

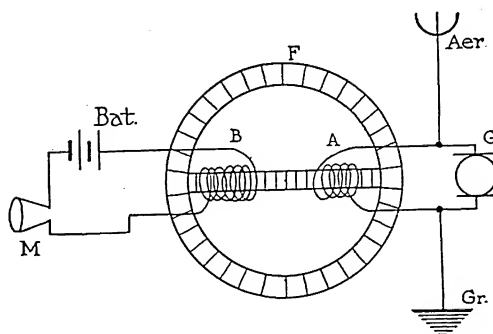


FIG. 13. MAGNETIC MODULATOR

A and B, coils; F, iron frame; M, microphone; Bat., battery; G, generator transmitter; Gr, ground; Aer., aerial.

induce electric currents in the aerial, and these in turn cause similar currents to flow in the grid circuit (LC) of the triode. Since the tube is oscillating, both the self-oscillation and that caused by the signal waves are present in the circuit at the same time. They are generally of different frequency, and combine to form electric beats by their alternate reinforcement and opposition. This is called heterodyning. It is analogous to the formation of sound beats when two musical tones of different pitch are produced at the same time.

The number of beats per second equals the difference in the two vibration rates. Thus, if a signal wave makes 100,000 vibrations, and the self-oscillation 99,000, in a second, there will be 1,000 beats per second. Since the local oscillation frequency can easily be changed by varying the capacity of the condenser or the inductance of the tuning coil, the pitch of the heterodyne note can be shifted to any desired value. The telephone receivers give a click

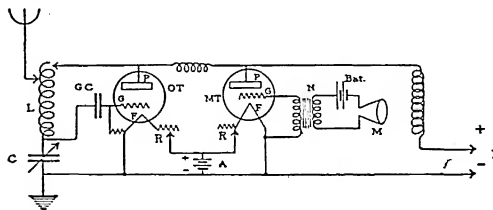


FIG. 14. RADIO TELEPHONE TRANSMITTER

N, telephone transformer; Bat., battery; M, microphone; OT, oscillator tube; MT, modulator tube.

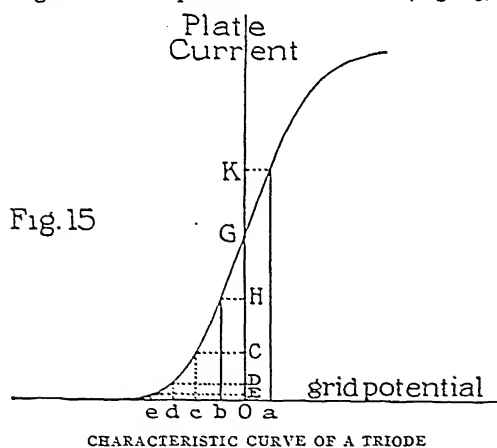
for each beat or impulse of current, and, consequently, the operator hears a musical note. If the self-oscillation is adjusted to the same rate as the signal, there will be no beats produced, and no sound will be heard.

Since a crystal detector cannot oscillate, it is useless for receiving continuous waves. The vacuum-tube circuit described above can be used for spark or damped waves by simply stopping the oscillations. This may be done by loosening the coupling; that is, separating coils L and T.

Radiophone Receivers. Any receiver which will detect radio-telegraph signals will also detect radiophone messages. Since the waves from a radiophone transmitter vary in amplitude, their effect upon a detector is the same as if they were damped. In fact, they are damped, but not so strongly or regularly as in case of the waves from a spark transmitter.

A crystal detector works very well for telephone receiving, but its sensitiveness is not so great as that of a vacuum-tube set. When a triode receiver is used, it must not be allowed to oscillate, as the local oscillations will combine with the high-frequency carrier wave of the message and give a whistling note, and, in addition, will distort the signals until they are unintelligible.

Grid-Bias Detection. A method of detection using a grid condenser and grid leak was discussed in another paragraph (see *Vacuum-Tube Receiver*). This method is open to the objection that, if the signal is strong, serious distortion will result. In order to detect very strong impulses, the grid condenser and leak may be omitted, and the grid given a negative charge by a battery. To understand why detection occurs under these conditions, consider the curve which results when the plate current of a triode is plotted against the potential of the grid; that is, how much it is positive or negative as compared to the filament (Fig. 15).



If the average potential of the grid is O, the corresponding plate current has the value G (Fig. 15). If the charge on the grid alternates, as from (a) to (b), owing to an incoming signal, the plate current varies between H and K. When HG equals GK, the changes of current

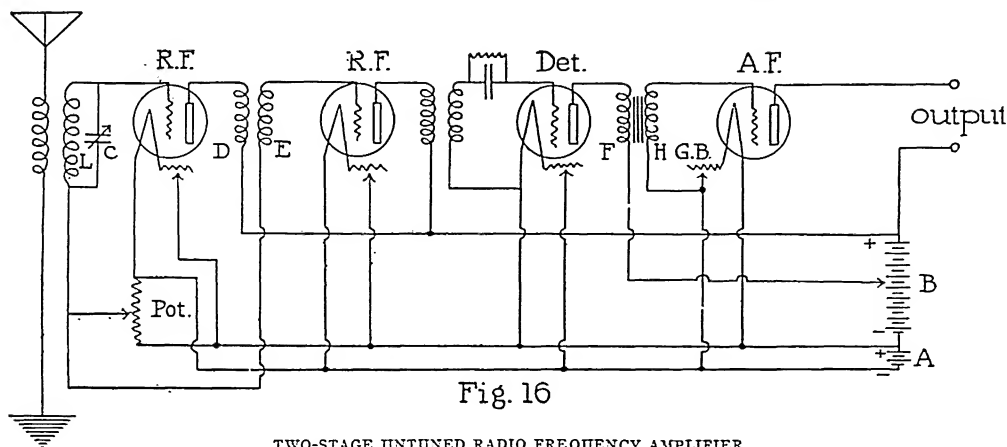
are symmetrical about the initial value, and there is no distortion of the impulses.

Now, suppose that the average grid potential is $-O_d$, and oscillates between c and e. The plate current changes back and forth from E to C, but has the initial value D. The positive impulse of current DC is much larger than the negative impulse DE, so that the plate current is now predominantly positive. It is partly rectified into pulsing direct current, which will operate the telephones or loud speaker. For this reason, the process of rectifying is called "detection."

The average grid potential may be kept at any desired value, such as $-O_d$, Fig. 15, by the use of a "C" battery of proper size (see Figs. 17 and 19). It may also be done by means of a grid-bias resistance (see G.B., Fig. 16, and R, Fig. 19). Here, advantage is taken of the potential drop across the rheostat when it is carrying current from the "A" battery. This latter method, however, is usually employed in connection with amplifier circuits, rather than with detectors (see *Use of "C" Battery in Amplifiers*, below).

Regeneration. A vacuum-tube receiver may be made more sensitive by coupling the plate and grid circuits, as explained in the discussion of vacuum-tube oscillators (see Fig. 11). Large currents are built up in the plate circuit, and if the coupling is kept loose enough, so that no oscillations are produced, louder signals are secured than would be possible without the regeneration. Such a circuit has two disadvantages. One is the distortion which may be introduced, thereby impairing the quality of the received signals. The other is the danger that it may break into oscillation. This would make the message unintelligible, and at the same time a wave may be radiated which would cause a shrill whistle or heterodyne note in other receivers in the neighborhood.

Super-Regeneration. It is possible to make some additions to an oscillating circuit so that it may oscillate at two different frequencies at the same time, one the same as that of an incoming signal wave, and another at low frequency; for example, 10,000 per second. The latter oscillation interrupts or stops the former at intervals (one twenty-thousandth of a second), and if the adjustments are correct, a very large signal current will be built up in the plate circuit, without actually breaking into high-frequency oscillation. It is really a very exaggerated case of regeneration. The low frequency is sufficiently high to cause no disturbing sound in the telephones, and thus a tube may be made to produce a very large response to the transmitted signals. Such a circuit is not very selective, and is so difficult to adjust and control that it has never become popular.



TWO-STAGE UNTUNED RADIO FREQUENCY AMPLIFIER

L-C, tuned pickup circuit; D-E, untuned transformer; R-F, radio-frequency tubes; Det., detector tube; A.F., audio-frequency amplifier tube; F-H, iron core transformer; Pot., potentiometer; G.B., grid-bias and rheostat.

Amplifiers

For long-range receiving, an amplifier is commonly used, in addition to a triode detector. Amplifiers which employ vacuum tubes may be divided into two classes: radio-frequency amplifiers, which magnify the high-frequency impulses before they reach the detector; and audio-frequency amplifiers, which strengthen the low-frequency current which leaves the detector.

Radio-Frequency Amplifiers. These may be classified into three groups, as follows: untuned, tuned, and superheterodyne. In the untuned R.F. amplifier (Fig. 16), electrical impulses are amplified without being rectified, by a triode which acts as a sensitive relay or repeater. Rapidly oscillating currents in the tuned circuit give the grid alternately positive and negative charges. When it is positive, electrons flow from the filament to the plate; when it is negative, the flow is stopped. The result is that strong currents rise and fall in coil D (Fig. 16), in perfect unison with the weak currents in the grid circuit LC. The flow in D induces voltage in coil E, which may be applied to a detector or again boosted by another stage of radio-frequency amplification, as indicated in Fig. 16.

The apparatus just described is very inefficient, because only a small portion of the energy in coil D is handed on the next stage. If the coupling between D and E is made tighter, in order to secure higher efficiency, the circuits of the R.F. amplifier are very apt to oscillate, thus destroying the quality of the signals. A potentiometer may be used to prevent this (Pot. Fig. 16). It is connected across the "A" battery, so that one end is positive and the other negative. By moving the slider, which is connected also to the grid, the latter may be made positive or negative.

If the grid is made positive, the circuit will not be able to oscillate, but the more positive it becomes, the weaker the signals. For this reason, the slider is kept as near the negative end as possible without causing oscillations. The use of a potentiometer results in larger direct current in the plate circuit, causes losses of energy in the grid circuit, and lowers the selectivity of the receiver.

Another method of preventing oscillations is the use of a large variable resistance in the plate circuit. This lowers the voltage in the tube, and also lowers the efficiency.

Tuned R.F. Amplifiers. A large gain may be secured by placing a variable condenser across the secondary of the R.F. transformer (E, Fig. 17). This makes it possible to tune the circuit EC_2 to the frequency of the impulses in coil D, and much higher voltages are induced. Since a triode detector gives a response proportional to the square of the voltage applied to its grid, a twofold gain in voltage across coil E by tuning it will result in a fourfold increase in signal.

A tuned R.F. amplifier has two disadvantages: one is the presence of an extra tuning control for each stage, so that in a two-stage amplifier three controls are needed ($C_1C_2C_3$, Fig. 17). Some manufacturers have solved this problem by an ingenious mechanical arrangement which enables the operator to tune two or more circuits simultaneously with one dial. This scheme is effective provided all of the circuits have exactly the same electrical characteristics. A second disadvantage is the tendency to oscillate when tuned. In a preceding paragraph (see *Radio-Frequency Amplifier*), two methods were discussed which prevent this, by wasting some of the energy.

A very effective scheme for stabilizing the circuits and at the same time utilizing all of the available energy is the neutrodyne (Fig. 17),

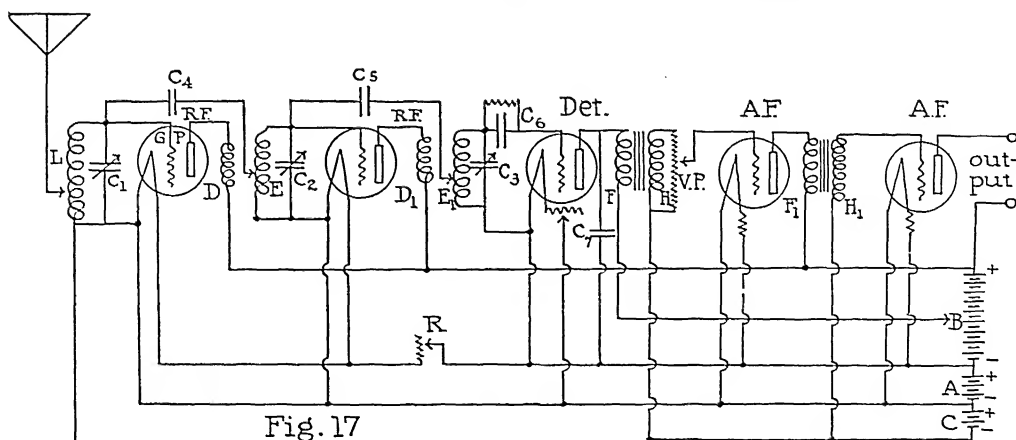


Fig. 17

TWO-STAGE TUNED RADIO-FREQUENCY AMPLIFIER (NEUTRODYNE), AND TWO-STAGE AUDIO-FREQUENCY AMPLIFIER (TRANSFORMER-COUPLED)

C₁ C₂ C₃, tuning condensers; C₄ C₅, neutralizing condensers; C₆, grid condenser and grid leak; R.F., radio-frequency tubes; Det., detector; A.F., audio-frequency tubes; D-E, D₁-E₁, tuned transformers; F-H, F₁-H₁, audio transformers; R, rheostat; C₇, by-pass condenser; V.P., volume-control potentiometer.

which employs small neutralizing condensers between the grids of the R.F. stages (C₄C₅, Fig. 17). The function of these condensers will be better understood if it is remembered that a vacuum-tube circuit oscillates because electrical impulses are exchanged or thrown back and forth between the grid and plate circuits. This requires some sort of coupling, which may be magnetic, as between coils L and T in Fig. 11, or electrostatic, as in a condenser. It happens that the grid and plate of a triode form a tiny condenser, which acts as a coupler between the two parts of the system. This coupling is so small that it is not effective until the parts are in resonance (tuned), when very little coupling is needed to cause oscillations. Note that in Fig. 17 the plate coil D is not tuned directly, but the magnetic reaction of current in E upon D gives the same effect as though the variable condenser were placed across D.

By connecting a small condenser of proper capacity between E and G, an electrical impulse is impressed upon the grid (G), equal in amount and opposite in sign to the impulse given to it by the condenser G-P. This destroys the coupling, and makes the circuit very stable. Shielding of various parts of the receiver by enclosing them in metal boxes helps to prevent magnetic and electrostatic coupling between them, and aids the neutralizing condensers in making oscillation impossible. Because of its great stability and high efficiency, the neutrodyne circuit is widely used in broadcast receivers.

Screen Grid Tubes. A four-electrode vacuum tube has been devised which may be used in radio-frequency amplifiers without the need of neutralizing condensers. The plate is sur-

rounded by a metal screen which is insulated from the other elements of the tube, and connected to the positive terminal of a battery of lower potential than that which furnishes the plate current. This positively charged screen or shield between the plate and grid has the effect of destroying the capacity coupling, so that the circuit is not likely to oscillate. In addition to this valuable characteristic, the screen-grid tubes produce remarkably high amplification, and these features together account for their wide use in R.F. amplifiers.

Superheterodyne. This is in one sense a broadly tuned radio-frequency amplifier, but differs so radically from the types already discussed as to require separate treatment. The essential features of a superheterodyne

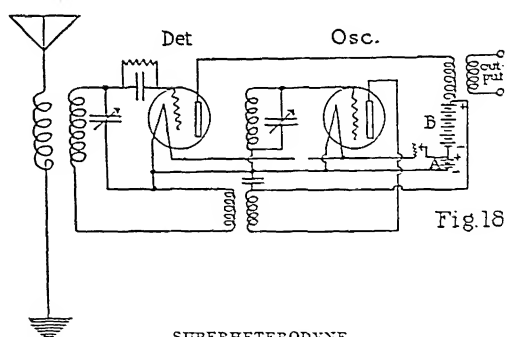


Fig. 18

SUPERHETERODYNE

Output goes to the intermediate-frequency amplifier.

are: first, the production of a beat note by heterodyning the incoming waves by means of a separate oscillating circuit (see *Undamped Wave Receiver*); second, the amplification of the heterodyne note by a radio-frequency amplifier tuned permanently to one frequency.

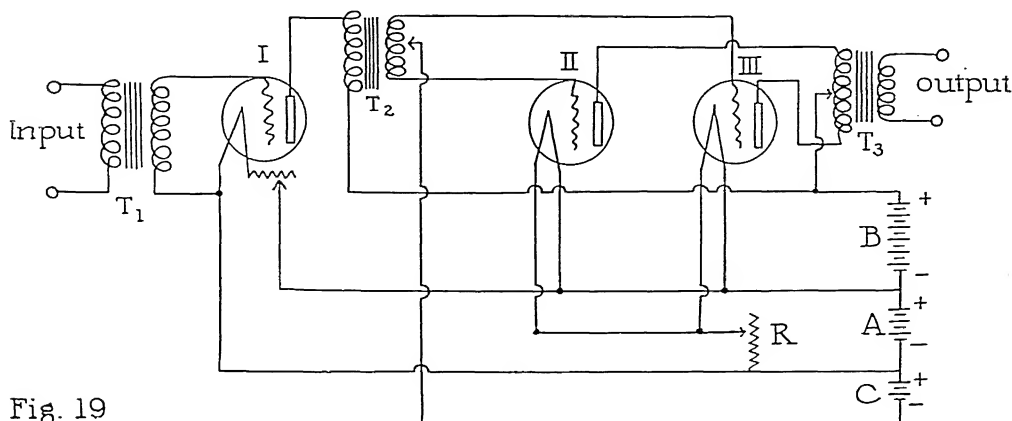


Fig. 19

PUSH-PULL AMPLIFIER

T₁, input transformer; T₂, duplex transformer; T₃, duplex output transformer; I, first audio tube, II and III, push-pull tubes; R, rheostat and grid-bias.

The heterodyning is done simply to make the second feature possible. The beat-note or intermediate frequency may be made to take any desired value by tuning the local oscillator, and is usually somewhere between 35,000 and 75,000 cycles (35 to 75 kilocycles) per second. It is easy to secure good amplification by means of transformers at such relatively low frequencies, and the transformers may be broadly tuned without the use of tuning controls, since only one frequency is used. After passing through several stages of amplification, the electrical impulses are rectified by a detector, and may be further amplified at audio frequency (see *Audio-Frequency Amplifiers*, below).

There are two distinct ways of arranging the circuits for securing the heterodyne or intermediate frequency. In the first, the impulses caused by the distant transmitter are rectified by a triode called the first detector (Det., Fig. 18), and the pulsing current is then heterodyned by an oscillating circuit (Osc., Fig. 18). The resulting beat note is fed into the amplifying system. Another arrangement combines the incoming and the locally generated oscillations directly without detecting action. In this case, the first or modulator tube serves as a radio-frequency amplifier. In both systems, the intermediate-frequency oscillation has superimposed upon it the low-frequency impulses or modulation caused by the microphone at the transmitter. When rectified by a detector, this audio-frequency current actuates the headphones or loud speaker.

Superheterodyne receivers are characterized by extreme sensitiveness, due to the large amplification; and by great selectivity, or ability to receive signals from one transmitter without interference from others working on slightly different wave-lengths. Usually, two

controls are provided, one of which tunes the pick-up circuit, and the other the oscillator.

Audio-Frequency Amplifiers. These are of three types: transformer-coupled, resistance-coupled, and impedance-coupled. The first type (see F-H, Figs. 16 and 17) may be explained exactly as in case of an untuned radio-frequency amplifier, but differs in that only audio impulses from the detector are amplified. It is very popular because of the large amplification easily obtained. Its chief disadvantage is the likelihood of distortion because of unequal effect upon currents of different frequency. If the high notes of music are poorly reproduced, the result is a booming or rumbling sound, while if the low notes are weak, the sound has a shrill, "tinny" quality.

Push-Pull Amplifier. Another kind of distortion results from overloading the tubes; that is, the signal voltage applied to the grids is so large that the corresponding plate currents have unsymmetrical variations. To see why this is true, refer to a characteristic curve, Fig. 15 (see *Grid-Bias Detection*). The best operating conditions for an amplifier tube are those values of steady grid potential and plate current which give the center of the straight portion of the curve. If, however, the operating point lies in one of the bent portions of the curve (for example, d, D, Fig. 15), variations of grid potential due to incoming signals result in unsymmetrical current variations (for example, DC and DE, Fig. 15). This distortion has the same effect as if current of double frequency were also present. In the loud speaker this will cause overtones which may seriously injure the quality of speech or music. In transformer coupled amplifiers, it is usually very difficult to secure the adjustments necessary to avoid this. However, in the push-pull amplifier it is completely eliminated by using two tubes in parallel (II and III, Fig. 19) and

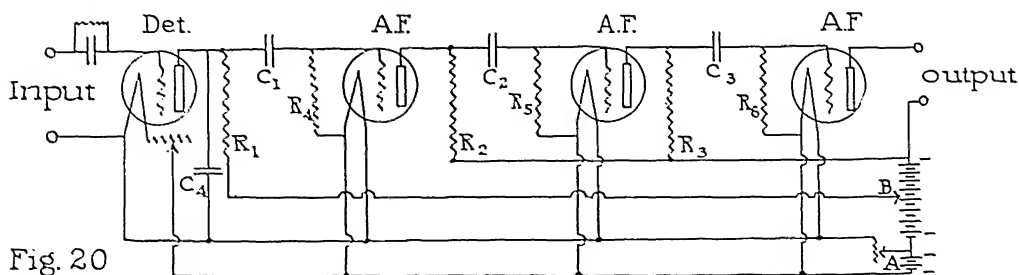


Fig. 20

THREE-STAGE RESISTANCE-COUPLED AMPLIFIER

R_1, R_2, R_3 , high resistances; R_4, R_5, R_6 , grid leaks; C_1, C_2, C_3 , blocking and coupling capacitors; C_4 , by-pass condenser.

two special duplex transformers (T_2 and T_3 , Fig. 10). The transformer windings are so connected that the double frequency e.m.f. (electromotive force, or voltage) induced in the secondary of the output transformer (T_3 , Fig. 10), by current from one tube, is in opposite phase to that caused by the other tube, so that both e.m.f.'s are canceled. On the other hand, the e.m.f.'s of fundamental frequency from both tubes are added, and constitute an undistorted, amplified reproduction of the input e.m.f.

In addition to the advantages of large power and freedom from second-harmonic distortion, a push-pull amplifier may have the filaments heated by alternating current, since any hum produced by one tube cancels that due to the other. For these reasons, it is much used as a power amplifier in the last audio stage.

Resistance-Coupled Amplifier. In a resistance-coupled amplifier, amplification is secured by applying to the grid of a triode the potential which exists across a high resistance which is carrying current. The resistance is placed in the plate circuit (R_1, R_2, R_3 , Fig. 20), and when the current varies, the potential across the resistance changes in proportion. Blocking condensers (C_1, C_2, C_3 , Fig. 20) are inserted to prevent the high voltage from the "B" battery being applied directly to the grids. These condensers really pass the changes in potential on to the grid, and may be thought of as coupling the plate of one tube to the grid of the next. For this reason, this type of amplifier is sometimes called "capacity-coupled," or "resistance-capacity-coupled." Grid leaks (R_4, R_5, R_6 , Fig. 20) are needed to prevent the grids from becoming permanently negative, just as in case of a detector using a grid condenser (see *Vacuum-Tube Receiver*). This amplifier does not give as great an increase in signal strength as a transformer-coupled, but has a very distinct advantage in its freedom from distortion, since all frequencies are amplified alike. It requires a much higher plate voltage for satisfactory action than does the other.

Impedance-Coupled Amplifiers. If the large resistances (R_1, R_2, R_3 , Fig. 20) are replaced by coils of large inductance, the circuit will amplify exactly as in the resistance-coupled. This method allows the use of comparatively low plate voltage, and resembles the resistance-coupled amplifier in its freedom from distortion and in degree of amplification.

Reflex Circuits. A reflex is a scheme for making one or more tubes do double duty; that is, to amplify at both radio and audio frequencies simultaneously. Fig. 21 shows a typical reflex circuit. After being amplified

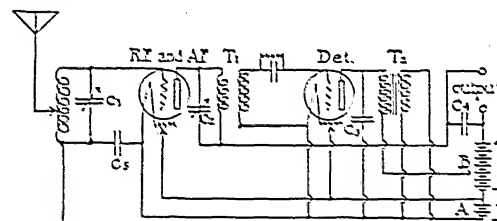


Fig. 21

REFLEX

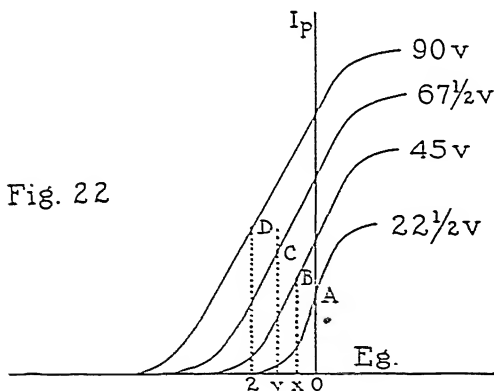
T_1 , radio-frequency transformer; T_2 , audio-frequency transformer; C_1, C_2 , tuning condensers; C_3, C_4 , by-pass condensers; C_5 , blocking condensers; R.F., radio-frequency tube; A.F., audio-frequency amplifier tube; Det., detector tube.

at radio frequency by the first tube and tuned transformer (R.F. Fig. 21), the electrical impulses are detected or rectified by the second tube, and then fed back to the first one through an audio transformer (T_2 , Fig. 21). Thus the first triode amplifies two frequencies at once, and a louder response is secured than would be possible with the same number of tubes without the reflex feature. Some receivers employ several tubes which do double duty, so that there is a considerable saving of battery current. Some reflexes use a crystal detector on account of its noiseless and undistorted response and freedom from oscillations. Such a scheme, of course, lessens the signal strength, since a crystal is not as sensitive as a triode. Reflexes are usually difficult to stabilize, be-

cause of the strong tendency for the "double-duty" tubes to oscillate.

Pentode Tube. This is a five electrode tube. In addition to the usual three electrodes, filament, plate, and control grid, there are two other grids. One of these, the cathode grid, is connected to the filament or cathode, and is placed near the plate. It serves to prevent electrons from being knocked off the plate by the bombardment of high speed electrons from the filament. Another grid, called the "space charge grid," surrounds the filament. It is connected to a source of high voltage, and prevents the accumulation of a space charge (cloud of electrons) near the filament. This allows many more electrons to be controlled by the control grid. The pentode is very sensitive, and can be designed for a large power output.

Use of "C" Batteries in Amplifiers. The necessity for a negative grid-bias or negative charge on the grid may be explained by using Fig. 22. If several "characteristic curves" of plate current and grid potential are plotted, each for a different voltage of the "B" battery,



FAMILY OF CHARACTERISTIC CURVES FOR A TRIODE
Eg, grid potential; Ip, plate current; v, volts in plate current.

it will be found that the higher the plate voltage, the farther to the left (toward larger negative values of grid potential) the curve lies. For an amplifier, the best working point on each curve is the center of the straight portion (A, B, C, D, Fig. 22), since variations of the current about this point will be symmetrical. In order to secure this desirable condition, the potential of the grid must be given values represented by the points O, x, y, Fig. 22. Thus the higher the plate voltage, the more negative the grid should be. If this negative charge is either too high or too low, the working point will lie near a curved portion of the characteristic curve, and variations of current about this point will be unsymmetrical, resulting in distortion (see discussion of *Push-Pull Amplifiers*).

Comparison of R.F. and A.F. Amplifiers. Assuming the same step-up ratio or amplification constant for the tube and transformer in both cases, the R.F. amplifier would give a much louder signal, as the following calculations indicate. Suppose the step-up ratio is 8. Then, if a voltage of 4 microvolts (4-millionths of a volt) is applied to the grid of a radio-frequency tube, the detector would get $8 \times 4 = 32$ microvolts, and since the signal response of a detector is proportional to the square of the applied volts, the resulting output voltage would be represented by $32 \times 32 = 1,024$. If, however, the same input voltage (4 microvolts) is applied directly to the detector, it will give an impulse proportional to $4 \times 4 = 16$, and this amplified 8 times by an audio amplifier would give a total effect of $16 \times 8 = 128$.

In this case, the R.F. amplifier would be eight times as effective as the audio. Unfortunately, the step-up ratio is always less for radio frequency than for audio, so that there is not so great a contrast as the example indicates. However, the advantage generally remains with the R.F. amplifier, especially the tuned variety. Often such a receiver will pick up signals that would be impossible for a receiver using only audio amplification, since the voltage induced by the waves may be too small to actuate the detector, unless first amplified at radio frequency.

Volume Control. It is often desirable to adjust the volume of sound from the loud speaker, and many schemes have been devised for securing this result. One of the best ways is to use a potentiometer across the secondary winding of the first audio transformer, so that the voltage applied to the grid of the next tube may be varied (see V.P., Fig. 17). Another satisfactory plan is the use of a rheostat in the filament circuit of the radio-frequency tubes. This method should not be used in case of a detector or audio amplifier, on account of the distortion which may result.

Aerials and Antennae

The term *aerial* refers to the elevated wires, while the word *antenna* is commonly used to designate the aerial and ground regarded as a unit.

There are many types of aerial in common use; for example, the T, inverted L, cage, fan, umbrella, ground wire, and loop. The T type and the inverted L are very similar. The former has the lead-in attached at the middle, while in the latter it is attached at one end. The horizontal portion of each is usually composed of several wires arranged in a plane parallel to the earth's surface. If the horizontal wires are arranged in such fashion as to form a hollow cylinder, or similar figure, the name *cage* is applied to the aerial. The aerial fan flares out at the top like a fan, while the

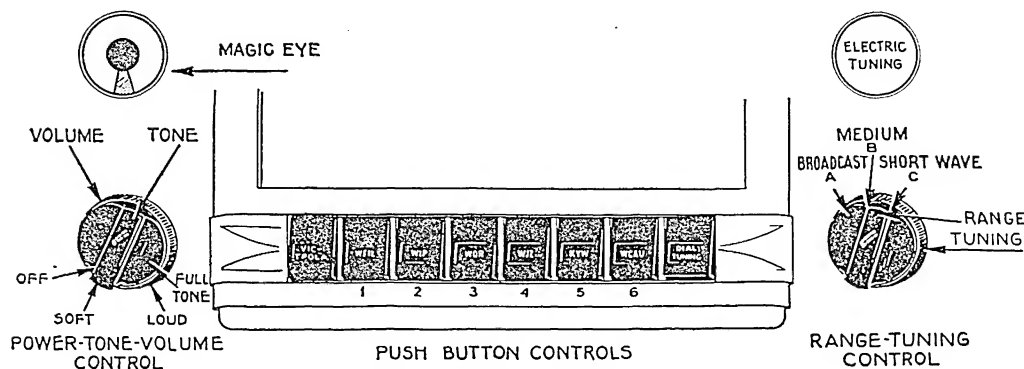


DIAGRAM OF THE CONTROL BOARD OF A MODERN RADIO

umbrella type has wires radiating from a single mast, like the ribs of an umbrella.

A number of wires stretched out near the ground, but insulated from it, may be used instead of a ground connection with any of the aeriels mentioned. Such an artificial ground is called a *counterpoise*. It is most often used in connection with T or inverted L aeriels for the transmission of short waves. An antenna of this sort usually has a lower resistance than one which includes a ground connection.

The aeriels described may be used both for transmitting and for receiving. Frequently, however, different aeriels are used by a station for sending and receiving. High aeriels are generally used for transmitting, because the waves sent out can be detected at greater distances. If an aerial which is high above the earth is used for receiving, the signals are louder than those picked up by a low aerial, but the high aerial has several disadvantages. The worst of these is the case with which it is affected by stray electric disturbances in the air. Such disturbances may be caused by lightning, by the gathering of electric charges upon the wires from the air, or by electric discharges in the upper layers of the atmosphere.

All of these disturbances are sometimes called *static*, but are more properly called *atmospherics*, or *strays*. Their effect upon a receiving instrument is to give irregular grinding, clicking, or hissing noises in the telephones. Strays are most numerous and troublesome during hot, moist weather. It has been found that, when the receiving aerial is close to the ground, the *atmospherics* are weakened more than are the signals from a distant station. In some cases, receiving is accomplished with a ground wire instead of an elevated aerial. The wire may be laid on the surface of the ground, or buried beneath it. The best results are obtained when the ground wire is insulated from the earth. The signals are always very weak, and several stages of amplification are needed. The *atmospherics* are almost com-

pletely eliminated, so that receiving can be carried on even during stormy summer weather. A simple loop aerial is also quite effective in getting rid of atmospheric disturbances. A few turns of wire are fastened to a frame a few feet in diameter which can be rotated about a vertical axis. Usually, no ground is used. The loop also serves as a radio compass, for only waves which come from a direction lying in the plane of the loop will affect it. The radio-compass stations of the United States navy utilize loops for finding the direction of the transmitting stations.

Directional Aeriels. A simple scheme for sending most of the energy of a transmitter in one direction is the use of a long, low, flat-topped aerial with the lead-in wire at one end. The radiations go mostly in a direction opposite to the open end of the aerial.

Beam System. It is possible to arrange the transmitting antenna in such a way that the radiated energy is sent out much like the beam from a searchlight. Behind the aerial, at a distance of one quarter wave-length of the waves, is placed a large curtain made of vertical and horizontal wires. This acts as a reflector, and the waves are concentrated within a narrow angle, usually about 30 degrees. Only short waves (under 150 meters' length) are used, and a separate antenna is required for each length of wave that is transmitted. This system is very economical, because of the low power required, and great distances are easily reached. For example, there is a two-way beam-radio service between England and Australia, with a wave-length of 25 meters.

Mechanics of the Receiving Set

A-Power Units. These devices furnish low-voltage direct current for heating the filaments of vacuum tubes. Alternating current from a house-lighting circuit is stepped down by a transformer, rectified, and filtered. The rectifier is usually an electrolytic cell or a number of plates of oxide-coated metal. In some A-power units, the filter is omitted and a storage battery

is charged directly by the pulsing rectified current. The battery, in turn, furnishes steady current for the tubes.

A.C. Tubes used in a receiver along with a B-power unit make it possible to operate the set directly from a house-lighting power line without batteries. In this case, a separate winding of the input transformer furnishes current for the filaments or heaters of the tubes. These are of two types. One has the usual three elements, and differs from a D.C. tube only in slight changes in design. The filament is very thick and rugged, and uses a heavy

current at low voltage. The other type has one or more heater elements which take alternating current, and supply heat to a metal cathode which is coated with some substance such as calcium or thorium, which emits electrons freely when heated. This cathode takes the place of a filament, and the electrical action of such a tube is the same as in the kind which requires a battery. The heater is independent of the radio circuits, so that there is usually very little trouble from humming noises.



EDWIN H. ARMSTRONG
The system of "wide swing" FM in broadcasting was developed by Major Armstrong.

Staticless Radio. The goal of inventors has been to eliminate the static difficulty that has hampered wireless ever since Marconi's first signal. As an answer Edwin H. Armstrong, professor of electrical engineering at Columbia University, who invented the universally used superheterodyne circuit in 1918, has promoted the "wide swing" frequency modulation, popularly called "FM." It operates on ultrashort waves. Demonstrations are proof of its bell-like clarity, the scratch of a match or the pouring of water into a tumbler sounding with true realism.

Early in 1942 twenty-two FM stations had been authorized to operate commercially, and thirty-nine others were under construction. In addition, there were fourteen experimental FM stations. In comparison with 50,000,000 standard broadcast receivers in the United States, FM receivers were estimated to have reached

a total of more than 100,000 early in 1942.

To understand how the FM system operates it is well to compare it with the older method of broadcasting known as "amplitude modulation." This comprises a carrier wave or live stream of energy as the center of a channel or "wire" through the air. When the microphone is actuated the carrier stays fixed, but sidebands are created which, in effect, blend the music or speech with the carrier wave. Atmospheric static can run rampant and play havoc along this line. It contaminates the ethereal stream and becomes imbedded in the program, causing clicks and noisy splashes.

Under frequency modulation, the carrier wave is made to do the work. Instead of remaining fixed it is made to fluctuate or wobble at the frequency of the tone of the music or voice. For instance, if a violin plays a 2,000-cycle note the carrier vibrates at that exact frequency. If the tone is soft, the carrier fluctuates less; if loud, the carrier becomes correspondingly more active. In other words, the carrier loses its own identity and becomes the radio equivalent of the music. It is not still long enough for static or other extraneous noises to mix with the program; thus the wave is amazingly silent, except for what goes through the microphone.

Armstrong and others have shown in demonstrations how remarkably clear FM may be even on a few watts of power, and how a few feet of wire dangling from a Venetian blind in the living room is antenna enough to intercept the simon-pure waves. Armstrong estimates effective range of the 7.5 meter wave at about 100 miles, although the broadcasts have been intercepted atop Mount Washington, N. H., 300 miles distant. Another advantage of FM method is that thousands of stations may operate without interference in the ultrashort wave spectrum. It is figured that 1,350 of these stations, each on a path 200 kilocycles wide, could operate between 1 and 10 meters.

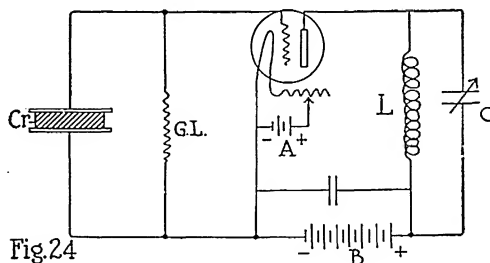


Fig. 24

CRYSTAL OSCILLATOR
Cr, crystal; G.L., grid leak.

Crystal Oscillators. Crystals of quartz have the peculiar property of vibrating at a constant frequency when alternating voltage is applied.

A thin slab with parallel sides, cut from such a crystal, and mounted between two metal plates, may replace the grid coil and condenser of a vacuum-tube circuit (see Fig. 24). When the plate circuit LC is tuned to a frequency which is anywhere near the natural frequency of vibration of the quartz slab, the tube will oscillate, and the frequency of oscillation will be determined by the crystal. This frequency depends upon the size of the quartz plate, and may be adjusted to any desired value by changing the dimensions of the piece. Because of the remarkable constancy of the oscillations, the vacuum-tube circuit containing the quartz slab may be used to control the frequency of a broadcast transmitter.

Lightning Arrester. This is simply a small gap, either in air or in a vacuum, between two metal terminals, one of which is connected to the aerial and the other to the ground. The arrester is in parallel with the primary coil of the receiver. When high electrical potentials are induced in the antenna by near-by lightning bolts, or when the aerial is directly struck, the current goes across the gap to the ground. The high voltage between aerial and ground ionizes the gas in the gap, and makes it a low-resistance path, while the inductance of the receiver coil offers a large impedance (effective resistance). Thus currents which might easily burn out the coils of the receiver are conducted to the ground and rendered harmless.

Loud Speakers. These may be classified into four groups, as follows: electromagnetic, electromechanical, electrodynamic, and electrostatic or condenser. The first group consists of loud speakers constructed on the plan of a telephone receiver, with electromagnets and steel diaphragm.

Variable current from the radio set flows in the electromagnets and causes the magnetic force to become alternately strong and weak. When the magnetism is strong, the steel diaphragm is attracted, and when it is weak, the diaphragm moves away from the magnet because of its own elasticity. Vibrations are thus set up which are in synchronism (keep time) with the radio signals, and may be imparted to the air column of a conical horn.

Electromechanical reproducers have a fixed magnet of horseshoe shape, between whose poles is placed a delicate iron strip called the armature. This may be fixed at one end or

in the middle. In the latter case, it is called a balanced armature (Arm., Fig. 25). A wrapping of fine insulated wire makes it an electro-magnet which is alternately attracted and repelled by the permanent magnet, as variable current flows through the coil. The armature is connected to a diaphragm (D, Fig. 25) by a mechanical system of levers or links, and thus passes on its motion. The diaphragm may in this type be non-magnetic, and this fact allows a wide choice in design. It may be simply a small flexible partition set into the base of a horn, or it may be a large cone of paper or other light material. In case a cone is used, it may be mounted with its edge rigidly fastened, or the edge may be free.

The electrodynamic, or moving-coil, speaker has an E-shaped electromagnet (M, Fig. 26), and a thin, light coil acts as an armature (C-C, Fig. 26). Current from the receiver flows in the coil, which thus acquires magnetic properties, and is attracted or repelled by the field magnet, according to the direction of the current. The moving coil is attached to a diaphragm to which it imparts its vibratory motion. This type of reproducer requires a separate source of current for the winding (FC, Fig. 26) of the field magnet. A rheostat in series with the field coil gives an easy method of volume control, since a small field current gives a weak magnetic field and results in a feeble attraction for the moving coil.

A unique variety of electrodynamic speaker has been developed, in which the moving coil and diaphragm are one and the same. A narrow, thin strip of metal is placed between

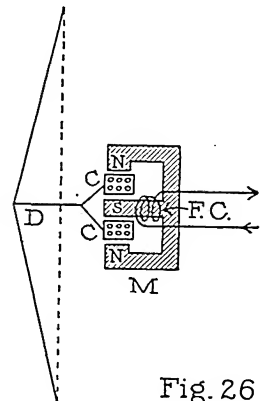


Fig. 26

ELECTRO-DYNAMIC LOUD SPEAKER

C, C, moving coil; M, magnet; F.C., field coil; D, diaphragm, or cone.

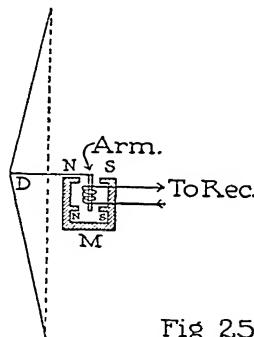


Fig. 25

BALANCED ARMATURE TYPE OF LOUD SPEAKER

Arm., armature; M, magnet; D, cone; Rec., radio receiver.

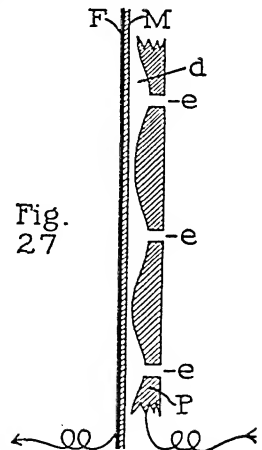


Fig. 27

SECTION OF CONDENSER LOUD SPEAKER

P, metal plate, with corrugations; M, flexible membrane; F, metallic film; e, e, holes.

the poles of a powerful magnet, and current from a receiver passes through the strip. The current sets up a magnetic field around the metal leaf, and the interaction of the two magnetic fields gives the strip a back-and-forth motion, in step with the current variations. This vibration is handed on to an air column in a horn.

The electrostatic, or condenser, type of loud speaker consists simply of a corrugated metal

plate, covered by a thin elastic membrane, which in turn is coated with a metallic film (see Fig. 27). A high voltage is applied between the film and the plate, the two conducting surfaces serving as a condenser. When fluctuating voltage from a receiver is superimposed upon the steady voltage already present, the electrostatic attraction between the plates changes. When the two voltages add their effects, the film is strongly attracted, and the elastic membrane is drawn into the shallow depressions between the corrugations of the plate. When the signal voltage opposes the other, the attraction is weak, and the membrane moves

to its initial position by elastic reaction. Thus the whole surface vibrates, and imparts its motion directly to the air. Loud speakers of this type may be built in small units which are placed side by side, and connected in parallel. In this way an entire wall may be covered, and a very large volume of sound secured.

Other Devices

Microphones. Several types of microphone have been used in radio broadcasting, for translating mechanical vibrations into varying electrical currents. One is the carbon-granule microphone, in which a flexible diaphragm makes contact with a large number of carbon granules. Current from a battery is varied

by the change in resistance of the carbon, which results from the varying pressure of the diaphragm in response to vibrations in the air.

Another type of microphone utilizes the principle of the condenser. A flexible diaphragm of aluminum alloy forms one plate of a condenser, and an insulated metal block forms the other plate, the two being separated by a thin air space. Vibrations of the air in front of it push the diaphragm closer to the block, and

thus vary the capacity of the condenser. When connected to the grid circuit of a vacuum tube, this fluctuating capacity causes corresponding changes in the plate current, which when sufficiently amplified can be used to control the modulator of a radio-phonetransmitter.

Another principle is used in the moving-coil microphone. This is very similar to the electrodynamic loud speaker, but the action is reversed. The movements of the diaphragm, which may be a very light coil or merely a thin strip of metal, back and forth in a strong magnetic field, cause fluctuating current to flow through it by induction. This current

is amplified and controls the modulator of the transmitter.

A fourth type of microphone makes use of a glow discharge at high voltage across an air gap. The air is ionized, and is in a very unstable electrical condition, so that slight vibrations due to sound waves set up alternating potentials of the same frequency as the sound. The varying electrical charges on the terminals of the gap may be used to control the output current of an amplifier.

Photoelectric Cells, or Photocells. One of the most interesting and useful of modern inventions is the photocell, or "electric eye," which translates the energy of light into electric current. A glass bulb is coated on the

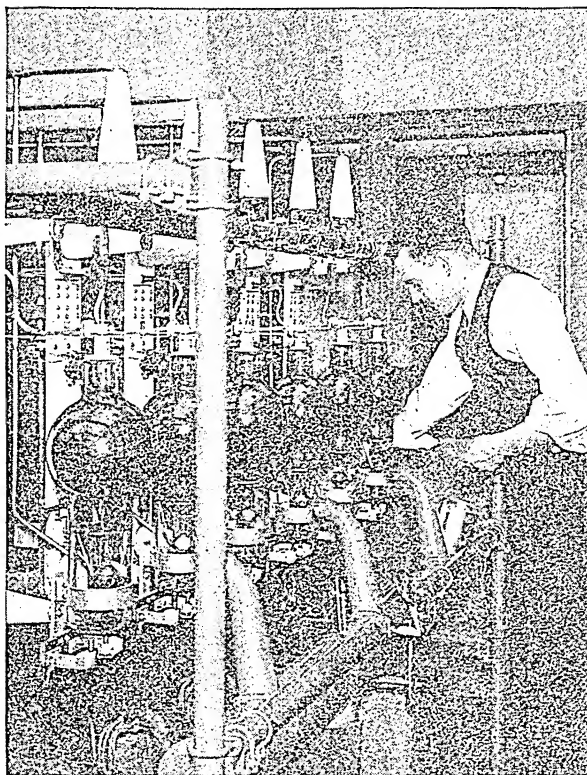


Photo: WOR

MODERN BROADCASTING APPARATUS

A section of the transmitting room in Carteret, N. J. of a modern broadcaster rated at 50,000 watts.

inside with a thin film of potassium, sodium, or some other photo-electric material which emits electrons freely when light falls upon it. A wire which makes contact with the film is sealed into the glass, and a second wire leads to an insulated electrode. A battery has its negative terminal connected to the film and its positive end to the other electrode. When the cell is in darkness, no current flows through it, but when light shines upon the sensitive coating through a "window" or clear space in the glass, a small current flows, owing to emission of electrons from the film. This is called "photo-electricity," and the amount of current is proportional to the intensity of the light.

Photocells may be divided into two groups, according to the degree of vacuum in the bulb. A high-vacuum cell has as much of the air as possible removed. It is remarkably constant in operation, but is less sensitive than the other type, which contains much more gas. In the gas-filled cell, the electron emission from the coating is no greater than in a vacuum cell, but ionization of the gas furnishes a much larger total current for the same degree of illumination.

The qualities of light sensitiveness and proportionality of current to the intensity of light make the photocell invaluable in the process of sending pictures by wire or radio (see *Transmission of Pictures*, below). It is much used in research laboratories, and astronomers find it useful in measuring the brightness of the stars. One of the "miracles" performed by its aid is the giving of "sight" to a blind person through his ears. A photocell takes the place of an eye, and changes in illumination are indicated by sounds heard through a telephone headset.

Wave Meter. This is a simple device consisting of a coil of wire with a condenser connected across its ends, and a galvanometer or other current indicator in series with the condenser. Either the inductance of the coil or the capacity of the condenser is variable, so that the circuit may be tuned. To measure a wave-length, or, more accurately, a frequency of oscillation, the wave meter is coupled to a transmitter by placing its coil near one of the coils of the transmitter. The meter is then tuned to resonance, which is indicated by

maximum current in the galvanometer. If the wave meter has been previously calibrated, the wave-length and frequency are known for each setting of the tuner.

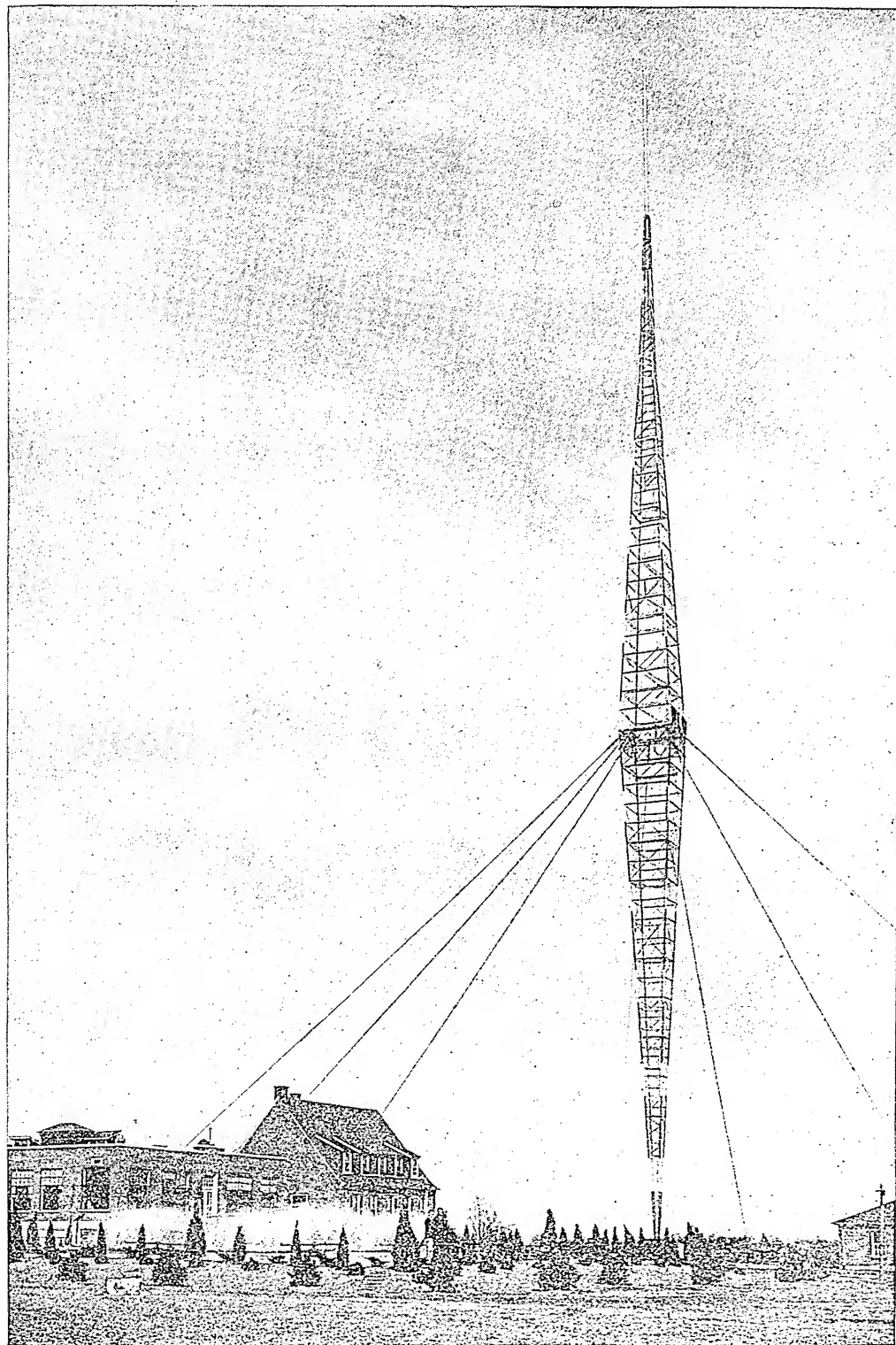
Wave Trap. This consists of a small coil of wire with a variable condenser connected across its terminals. It is placed in series with the aerial, and when tuned to any particular wave-length, it will prevent electrical impulses of that frequency from reaching the receiver. Its operation depends upon the principle that a circuit having inductance and capacity offers a very high impedance (effective resistance) to the passage through it of current which oscillates at the frequency for which it is tuned. Paradoxical as it may seem, it is true that a large current of this frequency will flow around and around within the wave trap, but will not flow in the larger circuit consisting of the aerial and ground, since it is "out of phase," or in opposition to the inducing voltages in the latter circuit. Thus an interfering wave may be suppressed, while a wave of slightly different frequency will affect the receiver.

Wired Wireless. This is a system of radio signaling in which the transmitted waves are guided to the receiving station by wires. Ordinary telephone lines, or even electric-light wires, may be used for this purpose. The sending apparatus is usually of the vacuum-tube type, and differs from the ordinary transmitter only to the extent that it has no aerial. The transmitter is coupled to the guide wire through a transformer or condenser, and oscillations are induced in the wire by the action of the transmitter. At the far end of the guide wire, the receiving set is similarly coupled to the wire, and is affected in the same way as if the waves were picked up by an aerial. This system may be used for the simultaneous transmission and reception of several messages at once, and at the same time the wire may serve for ordinary telephone communication or power transmission. When several messages are sent together, different wave frequencies are used for each. Wired wireless preserves the secrecy of messages, as the waves do not spread in all directions, but follow the wire. The power needed is very small, for the same reason.

Conditions and Varieties of Radio Telephony

Range of Transmission. This depends upon several factors: the power of the transmitter, atmospheric conditions, character of the soil, presence of forests, tall buildings, etc., as well as the sensitivity of the receiver. The range is much greater over sea than over land, probably because of the greater electrical conductivity of the water. The range over land differs widely in different directions, and there

may be "dead areas" or "blind spots" where radio waves seem to be much weakened. This situation may be the result of screening by forests, high hills, or tall steel buildings. Also, the soil may be a very poor conductor in some places. Even under ideal conditions, the intensity of the waves would decrease in proportion to the distance, because the energy spreads over a larger region as it progresses.



A Powerful Transmitting Station. A view of the transmitter plant for WLW, showing vertical radiator type antenna 831 feet high. The spray pond is part of a system for cooling the tubes used in the transmitters.

The condition of the atmosphere has a very great effect upon the range of transmission. This seems to be due to the presence in the air of electrically charged molecules and free electrons. When the air has many ions, its electrical transparency is greatly lessened, and much energy is absorbed. The ionization is probably caused mostly by electrons emitted from the sun, and by the action of ultraviolet light. There is much evidence that the upper atmosphere is permanently ionized, and that the degree of ionization varies widely in different parts and at different times.

This region is called the Kennelly-Heaviside layer. At night it is 150 to 400 miles above the earth, while during the day it is only 50 to 100 miles up. This results in striking differences in the range of transmission of radio waves. The range at night is usually two to

is now very common for radio-telegraph signals to be heard halfway around the world, even though the power used is only a few watts. (One watt equals $1/746$ horse power.) While a short-wave transmitter is reaching out to a receiver several thousand miles away, it may be quite inaudible to a listener only two or three hundred miles away. The zone within which signals from a given station are not heard is too far from the transmitter to get the direct wave, and too close to intercept waves reflected from the upper air (for example, point K, Fig. 28). The width of a skip gap, or silent zone, and its distance from the transmitter, depend upon several factors, among which are the height of the Heaviside layer at that particular time, and the wave-length used. Experiments with short waves have been largely responsible for the information which has been gathered concerning the character of the ionized region of the atmosphere.

Fading. Since the degree of ionization or the effective height of the Heaviside region is constantly changing, especially at night, the waves may be reflected to a certain place at one instant, and a moment later reflected elsewhere. The effect is much like that produced by a tilting mirror, which reflects a beam of light first here and now there. The result upon a radio receiver is a series of irregular and frequent changes in the strength of the signals, which is called fading. The situation is further complicated by interference. Two portions of a wave may reach a receiver by two different paths, one along the surface of the earth (AB, Fig. 28), and the other going up to the Heaviside layer and thence back to earth (ACB, Fig. 28).

These two wave portions may be partly or wholly out of phase (the trough of one meeting the crest of the other), and destructive interference is the result. Thus the signal would be absent or very weak. The degree of interference constantly changes with the varying conditions in the Heaviside layer, and is responsible for much fading. Fading is less marked in daytime than at night, owing, perhaps, to greater stability of the ionized region. Conditions are usually worst at twilight and dawn, when the amount of ionization is rapidly changing. Fading is less troublesome during reception from a strong near-by transmitter, since in this case most of the energy reaches the receiver along the ground, without reflection from the upper atmosphere.

Broadcasting. One of the most widespread and popular uses of radio is the transmission of entertainment and instruction to all who care to listen-in. Since the introduction of broadcasting for the benefit of the public, in 1921, the interest in this form of entertainment has grown until there are hundreds of broadcast transmitters and hundreds of thousand-

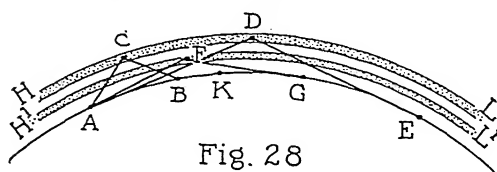


Fig. 28

VERTICAL SECTION OF EARTH'S ATMOSPHERE

H, L, Kennelly-Heaviside layer, at night; H₁, L₁, same in daytime; A, radio transmitter; B, K, G, E, receiving stations.

five times as great as during daylight. The short daytime range may be partly accounted for by the absorption of energy in ionized air near the earth, but another important factor is the reflection of waves from the Heaviside layer. This strongly ionized stratum reflects and refracts (bends) waves which reach it, so that they return to earth at great distances from the transmitter. When the Heaviside layer is high, as at night, the waves reflected from it reach the earth much farther from the transmitter than during the day, when it is low (compare paths ADE and AFG, Fig. 28).

Round-the-World-Transmission. One of the curious and striking results of the presence in the atmosphere of the Heaviside layer is the possibility of sending signals entirely around the earth by several successive reflections. This effect has been noted many times, by engineers in high-powered transmitting stations. It is possible by means of automatic recording instruments to measure the time lag of the round-the-world waves, as compared with waves coming directly from a near-by transmitter. Since the time and the speed (186,300 miles per second) are known, the distance traversed can be calculated (distance equals the speed multiplied by the time).

Short-Wave Transmission. The Heaviside layer seems to be one of the chief factors in the success of all long-distance transmission, and this is especially true of short-wave work. It

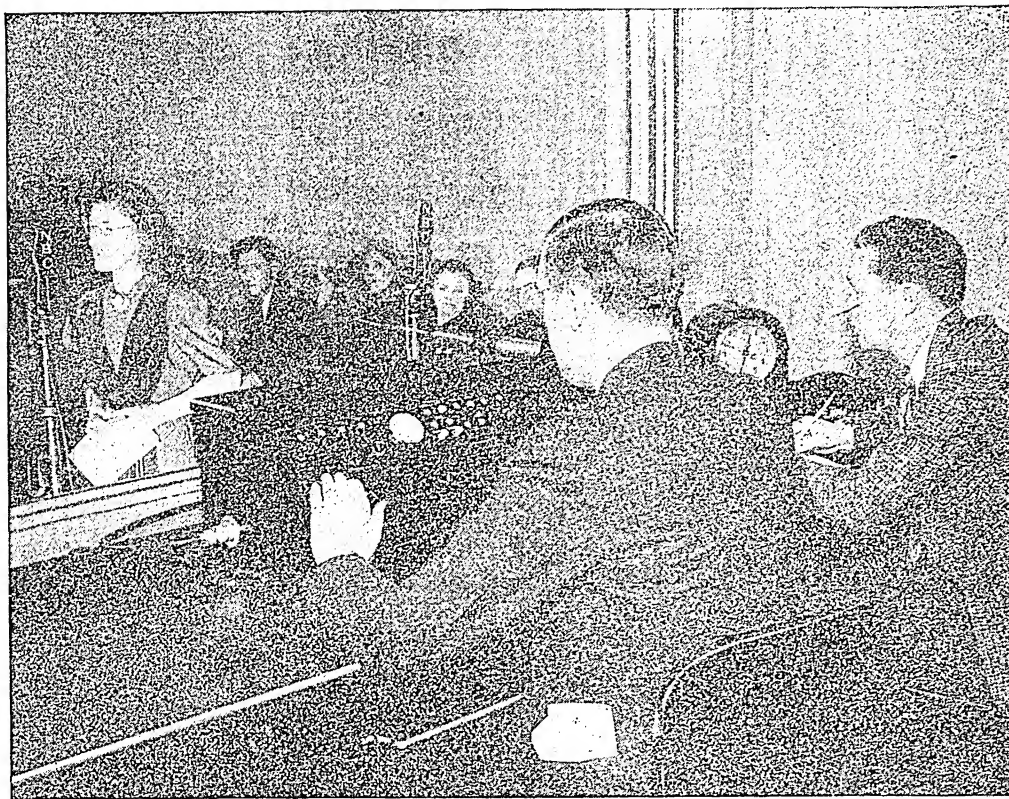


Photo: N. B. C.

BROADCASTING OVER A NATIONAL NETWORK

From a glass-enclosed control room, the program producer directs the actors at the microphone. The studio engineer adjusts the tone and volume of the broadcast before it goes out over the air.

of receivers in use all over the world. In addition to general educational benefits accruing from widespread use of radio, many colleges utilize it well in disseminating knowledge.

Radiothermics is the application of radio frequency heating to speed industrial processes, which at the same time increases their efficiency. Radio waves may be used in heating, drying, gluing, stitching, annealing, welding, riveting, and even in deactivating enzymes in the preparation of dehydrated foods. A laminated airplane propeller can be processed in minutes compared to hours required by ordinary heat and pressure methods. Radio high-frequency furnaces, or ovens, are a postwar prospect. In them railroad ties may be seasoned quickly and cakes of textiles dried uniformly. Even rubber may be radio-cemented to wood or plastics; fabrics seamed by radio heat; metals hardened; plywood glued; and fresh vegetables deactivated without loss of flavor or color. Remarkable advances have been made in this thermic realm.

Electronics. The use of radio in the war and of radio-electronic devices in the war-effort of industry, to speed production and increase efficiency, has brought new recognition to the

word *electronics*, which was born of radio. For years, the radio industry has manufactured more than 100,000,000 electron tubes annually. Radio tubes which produce electrons, control them, and harness them to service in communication and industry, have become the heart of electronics (which see). These tubes have paved the way for major advances in the radio art for the past two decades, including broadcasting, shortwaves, and television. Electronics has opened the micro-waves spectrum which borders on the frontier of light. In the electron microscope, it has even passed beyond this frontier, to utilize the electrons as "light beams" infinitely smaller than actual rays of light.

Wave Channels. By the Federal law of 1927, the wave frequencies set aside for use by broadcasting stations extend from 550 kilocycles (550,000 cycles) to 1,500 kilocycles. The corresponding wave-lengths are 545 to 200 meters, approximately. It has been found that either of two stations whose oscillation frequencies are 10 k.c. (kilocycles) apart can be received without interference from the other.

Transmission of Pictures. There are several systems of sending pictures by radio, only one



Photo: R. C. A.

A TEST RADIOPHOTO RECEIVED DIRECT FROM MOSCOW BY THE RADIO CORPORATION OF AMERICA

of which will be discussed, since most of the fundamental principles utilized are common to

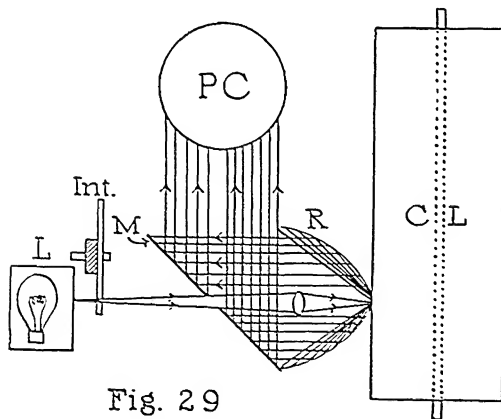


Fig. 29

OPTICAL SYSTEM OF A PICTURE TRANSMITTER

L, lamp; Int., interrupter, or chopper; M, mirror; R, parabolic reflector; CL, cylinder on which picture is placed; PC, photo cell.

all. The transmitter has a motor-driven revolving cylinder, attached to a screw-threaded shaft, so that, as it revolves, it moves along

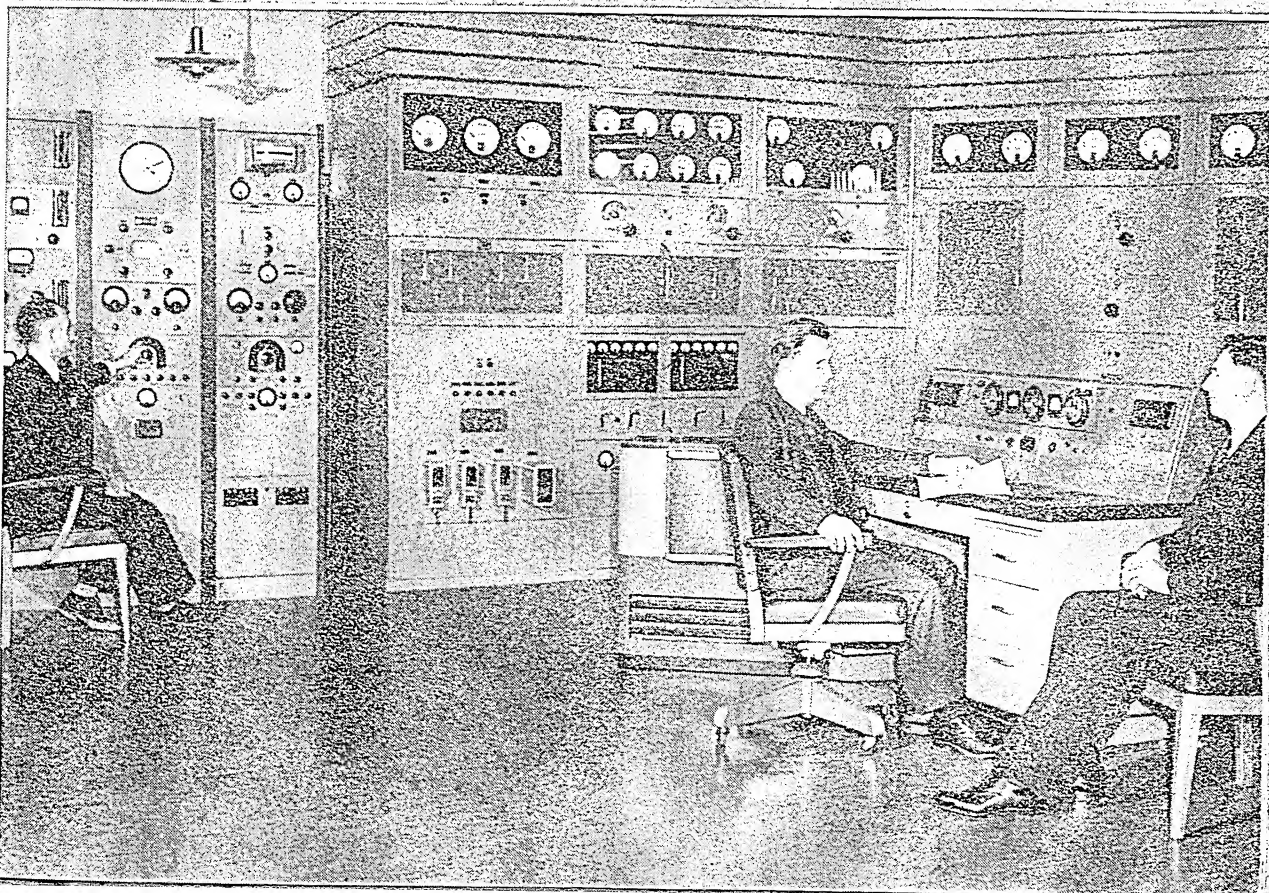
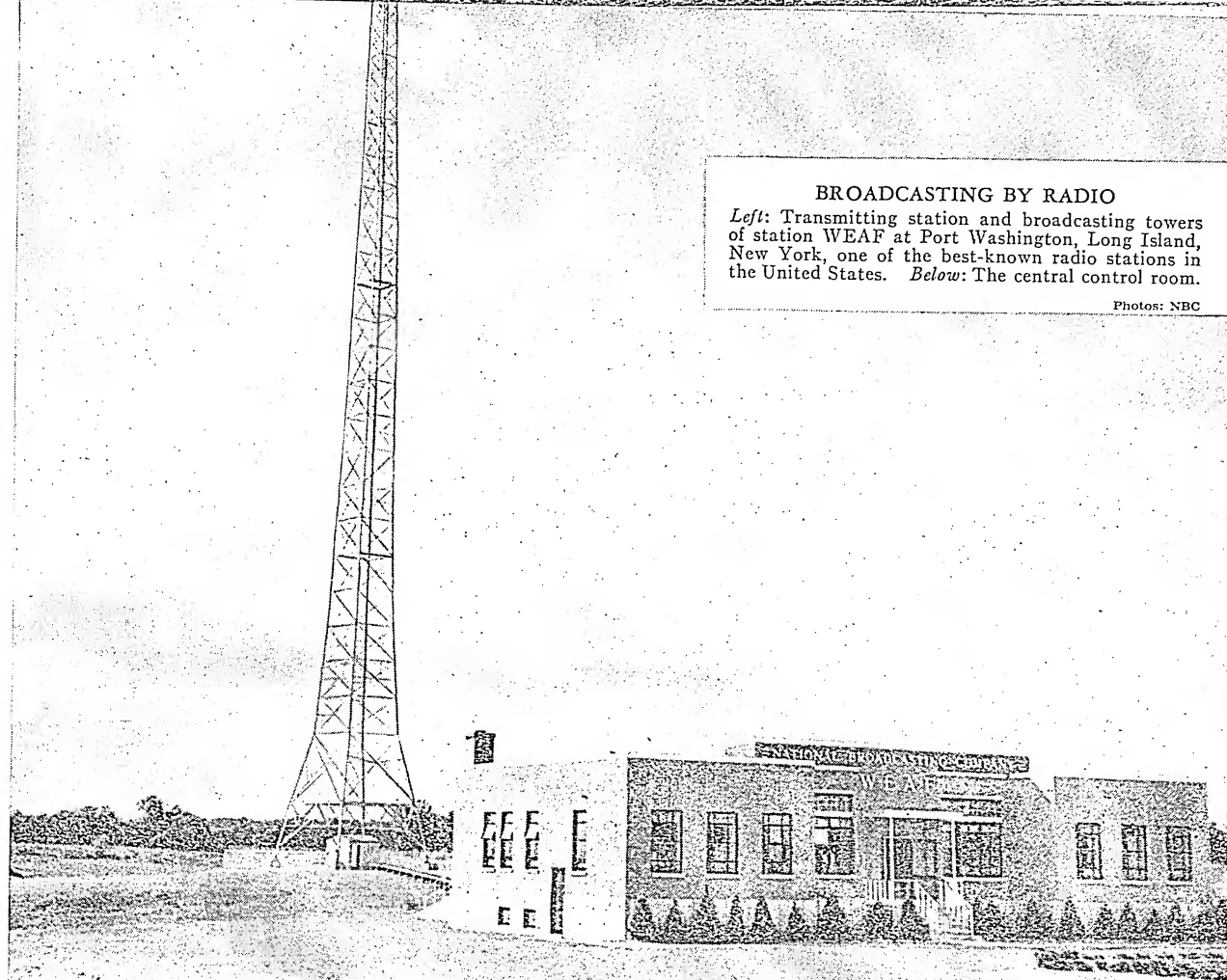
the shaft. A photograph is wrapped around the cylinder, and light from a lamp is concentrated by a lens to a tiny spot on the picture (see Fig. 29). Since the picture is in constant motion, different parts of its surface come successively under the spot, and light reflected from it shines upon a photocell. As a result, current flows through the cell in proportion to the strength of the light, which in turn depends upon the reflecting power of the spot on the picture. A motor-driven chopper or toothed wheel interrupts the beam from the lamp, so that a series of flashes of varying intensity reach the photocell.

The rate of revolution of the photograph is several feet per second, and the forward motion along the shaft is about one sixty-fourth of an inch per turn, with the result that a surface of about fifty square inches is covered per minute. A picture measuring 5 x 8 inches may be transmitted in about three-fourths of a minute. The number of light flashes reflected, and consequently the number of current impulses in the photocell, is several hundred per second. This variable current is amplified, and applied as a modulation to a radio transmitter, just as the current from a microphone does in ordinary broadcasting.

BROADCASTING BY RADIO

Left: Transmitting station and broadcasting towers of station WEAF at Port Washington, Long Island, New York, one of the best-known radio stations in the United States. *Below:* The central control room.

Photos: NBC



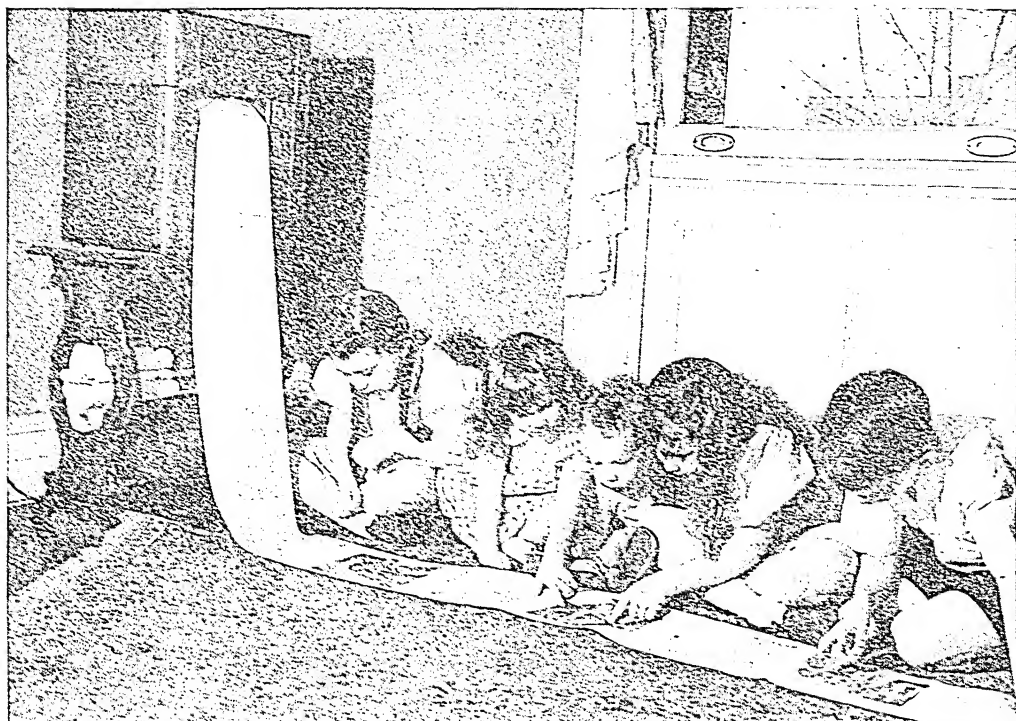


Photo: St. Louis Post-Dispatch

RECEIVING THE RADIO NEWSPAPER

The facsimile transmitter, or scanner, in the newspaper office sends the printed page. The facsimile receiver here shown picks up the electrical impulses and amplifies them to such an extent that they actuate a printer bar. The receiver carries white paper which is printed and delivered as shown here. This equipment represents the result of ten years of research and experimentation.

The picture recorder is much like the transmitter. A piece of photographic print paper is wrapped around a revolving cylinder, and light from a neon glow tube is focused upon it. This lamp, which is extremely sensitive to changes of current through it, is connected to a radio receiver. The latter amplifies and rectifies the impulses induced in its aerial by the waves from a picture transmitter, so that the neon tube gives more or less light as the current from the receiver varies. The circuits are so arranged that, when a bright part of the original picture moves past the light beam, the current through the glow lamp in the receiver decreases, and the light sent to the photographic paper is feeble. On the other hand, when the original is dark, the receiver gives a strong current, and the lamp flashes brightly and prints a dark spot on the paper. Thus, point by point, the picture is received, and when the print is developed, the image appears exactly like the original. If a negative is desired, a film is used instead of print paper, and the vacuum-tube circuits are adjusted to furnish a large current to the neon tube when the original picture is bright. This gives a dark spot on the film, and makes a reversed image.

Successful photoradiograms (transmitted pic-

tures) require exact synchronism of the moving parts at both transmitting and receiving stations, and also exact alignment of the picture and its copy, on their respective cylinders. The cylinders, which are alike in size, are driven by motors which are kept at constant speed by current from vacuum-tube circuits. These in turn are stabilized and controlled by tuning forks. Any deviation from exact motion is corrected by special radio signals which operate automatic apparatus for retarding or speeding up the motion of the recorder. Similar signals make certain that both cylinders start at the same instant. Correct framing or placement of the paper on the recorder is made possible by automatic signals which cause the glow tube to flicker if the alignment is not right, and to appear steady when the paper is correctly placed. See pages 3967, 3968. R.F.M. and O.E.D.Jr.

Related Subjects. The reader is referred to:

Advertising	Light
Aircraft	Marconi, Guglielmo
Communication	Millikan, Robert A.
Cosmic Rays	Moving Pictures
Crookes Tubes	Photography
Electricity	Radioactivity
Electromagnetic Theory	Roentgen Rays
Electromagnetism	Television
Ether	Weather
Induction Coil	

Glossary of Terms Used in Radio

- "A" Battery:** Used to heat the filaments of radio tubes.
- Aerial:** The elevated portion of a condenser antenna.
- Alternating Current:** An electric current which has the direction of its flow periodically changed. Abbreviation, A.C.
- Ammeter:** An instrument for measuring electric current.
- Ampere:** Unit of current.
- Amplification Factor:** The ratio of a change in plate voltage to the change in grid potential which would produce the same variation in the plate current of a vacuum tube.
- Antenna:** A conductor or a system of conductors for radiating or receiving radio waves.
- Arc:** A current discharge across a gap, conducted by highly heated and ionized vapors.
- Arrester:** See *Lightning Arrester*.
- Audio Frequency:** Frequencies within the range of the human ear.
- "B" Battery:** Used in the plate circuit of a vacuum tube.
- Beat-Note, or Beat-Frequency:** The sum or difference of two tones or frequencies.
- B-Eliminator:** See *B-Power Unit*.
- Bias:** See *Grid Bias*.
- Blocking Condenser:** Used to prevent flow of direct current.
- B-Power Unit:** A device for converting A.C. to D.C. for use in place of a "B" battery.
- Broadcasting:** Transmission of radio signals for public benefit.
- By-Pass Condenser:** Provides a low-impedance path for high-frequency current.
- Capacitive Coupling:** The association of one circuit with another by means of capacitance common or mutual to both.
- Capacity, or Capacitance:** The property of a device to store energy in electro-static form.
- "C" Battery:** Used to maintain a difference of potential between the grid and the filament of a vacuum tube.
- Carrier Wave:** Refers to waves upon which a modulation is superimposed.
- Characteristic Curve:** A graph of grid potential vs. plate current.
- Choke Coil:** A coil wound to have great self-induction or choking effect when in the path of an alternating current.
- Condenser:** A device for storing electric charge; usually metal plates separated by insulating material.
- Conductor:** A substance which allows electric current to pass through.
- Continuous Waves (C.W.):** Waves of constant amplitude.
- Counterpoise:** A system of wires or other conductors elevated above and insulated from the ground, forming the lower system of an antenna.
- Coupling:** The association of two circuits in such a way that power may be transferred from one to the other.
- Current:** Flow of electricity.
- Cycle:** One complete set of the recurrent values of a periodic phenomenon.
- Damp (or Damped) Waves:** Those whose successive amplitudes are less.
- Detector:** Device for changing A.C. to D.C.; a rectifier.
- Dielectric:** Insulating material.
- Direct Coupling:** The association of two circuits by having an inductor, a condenser or a resistor common to both circuits.
- Direct Current:** An electric current flowing continuously in one direction; always from positive to negative source. Abbreviation, D.C.
- Direction Finder:** A radio receiving device which permits determination of the line of travel of radio waves received.
- Doublet Antenna:** Two elevated conductors substantially in the same straight line, or substantially equal length, with the power delivered at the center.
- Electrode:** The conductor by which current enters or leaves a tube or cell.
- Electromagnetic:** Applied to disturbances caused by changing magnetic and electric fields.
- Electromotive Force:** That which maintains a flow of current; amount of energy secured from an electrical source per unit quantity of electricity passing through the source.
- Electron:** The smallest negative charge; a part of an atom.
- Facsimile Transmission:** Broadcast of a graphic record having a limited number of shade values.
- Fading:** The variation of the signal intensity received at a given location from a radio station as a result of changes in the transmission path.
- Filament:** That part of a radio tube which is heated by current, for the emission of electrons.
- Filter:** A device for facilitating or hindering the flow of current of certain frequencies.
- FM:** Frequency modulation.
- Frequency:** The number of cycles per second.
- Generator:** A machine for supplying electric current.
- Grid:** The control electrode in a three-element tube.
- Grid Leak:** A high resistance used to prevent the grid from becoming too highly charged.
- Ground Wire:** A conductive connection of the radio apparatus with the ground.
- Harmonics:** Frequencies which are integral multiples of the fundamental.
- Heaviside Layer:** Ionized region of upper atmosphere.
- Henry:** A unit of inductance.
- Heterodyne:** The beat-frequency formed by the combination of two frequencies.
- Iconoscope:** Cathode ray tube or radio "eye" of television camera.
- Impedance:** Opposition to flow of A.C., due to resistance, inductance, and capacitance.
- Inductance:** Electrical inertia; product of the number of turns of wire and the lines of force through a coil when unit current flows.
- Induction:** The interaction of two magnetic or two electrostatic fields.
- Insulator:** A non-conductor of current.
- Ion:** An electrically charged molecule or atom.
- Kennelly-Heaviside Layer:** See *Heaviside Layer*.
- Kilocycle:** When used as a unit of frequency, is a thousand cycles per second.
- Kinescope:** Cathode ray tube or radio "eye" of television receiver; picture appears on fluorescent end of the funnel-shaped bulb.
- Lead-In:** That portion of an antenna which completes the electrical connection between the instruments and the main portion of the antenna.
- Lightning Arrester:** A device used to prevent lightning from entering a radio receiver.
- Loop:** A large coil (one or more complete turns of wire) used as an aerial.
- Megacycle:** When used as a unit of frequency, is a million cycles per second.
- Megohm:** One million ohms.
- Microfarad:** A unit of capacitance.
- Microphone:** A device for converting the energy of sound waves into electric current.
- Modulation:** Irregular changes in the amplitude of a wave due to the effect of current from a microphone or similar device.
- Neutralizing Condenser:** Used between successive grid circuits to prevent oscillation.
- Neutrodyne:** A circuit which employs neutralizing condensers to prevent oscillation.
- Ohm:** A unit of resistance.
- Oscillation:** A rapid periodic reversal of current.
- Oscillator:** A tube and attached circuits in which direct current is converted into A.C. by the interaction of the grid and plate circuits.
- Oscillatory Circuit:** A circuit containing inductance and capacitance, such that a voltage impulse will produce a current which periodically reverses.
- Pentode:** A vacuum tube with five electrodes, which are: filament or cathode, plate, and three grids. See *Pentode Tube*.

Glossary of Terms Used in Radio—Continued

Phase: Time relation between two vibrations; the portion of a vibration already completed.

Photocell, or Photoelectric Cell: A tube which allows current to flow through it when it is illuminated.

Plate: The high-potential electrode of a vacuum tube.

Potential: The degree of + or — compared to some standard, measured in volts; the work necessary to move a unit charge from the earth to the given point.

Potentiometer: A resistance with its ends at different potentials, and a movable contact for obtaining intermediate potentials.

Push-Pull: A type of amplifier using two tubes in parallel, and two double-winding transformers.

Range of Transmission: The distance at which waves may be detected.

Radiation: Electromagnetic waves.

Radio Beacon: A radio transmitting station at a fixed geographic location which emits a distinctive or characteristic signal to facilitate mobile stations to determine bearings on a course.

Radio Frequency: Frequencies above the audible range.

Reactance: Opposition to flow of A.C., due to inductance and capacitance.

Reactivation: Renewal of the ability of the filament of a tube to emit electrons. A new coating of thorium oxide is formed on the surface of the filament, by baking it out from the interior.

Rectifier: A device for changing A.C. to D.C.

Reflex: A circuit in which one or more tubes amplify at both radio and audio frequencies.

Regeneration: The process of building up a large alternating current in the plate circuit of a vacuum tube by passing some energy back to the grid circuit through coupling.

Resistance: Opposition to flow of direct current.

Resonance: Two circuits are in resonance when their natural frequency of oscillation is the same.

Rheostat: A variable resistance.

Screen Grid: An electrode, usually associated with suitable auxiliary screening, and interposed between certain of the other electrodes substantially to eliminate capacitance between them.

Secondary: The coil of a transformer in which current is induced.

Selectivity: The ability of a receiver to separate signals from two stations whose oscillation frequencies are close together.

Shield: A metal box or screen around part of a receiver,

to prevent magnetic or electrostatic coupling with other parts.

Shunt: A conductor placed across the terminals of an instrument.

Side Band: A band of frequencies on either side of the carrier frequency produced by the process of modulation.

Single Side Band Transmission: That method of operation in which one side band is transmitted and the other side band is suppressed. The carrier wave may be either transmitted or suppressed.

Static: Noises in a receiver due to natural electrical disturbances. (Also called "atmospherics" or "strays.")

Superheterodyne: A method of reception in which the received voltage is combined with the voltage from a local oscillator and converted into voltage of an intermediate frequency which is usually amplified and then detected to reproduce the original signal wave.

Television: The electrical transmission by wire or radio of a succession of images and their reception in such a way as to give a continuous and simultaneous reproduction of the object or scene before the eyes of a distant observer.

Transformer: Two coils coupled together, so that current in one induces current in the other, by magnetic forces.

Triode: A vacuum tube containing three electrodes.

Tuning: Adjusting a circuit to the same natural frequency as electrical impulses.

Undamp (or Undamped) Waves: Those whose amplitudes remain constant.

Vacuum Tube: A tube of glass or metal exhausted of air and containing a filament for the creation of electrons; a plate positively charged to attract the electrons, and a grid for controlling the electronic flow.

Variometer: An inductance variable by changing the coupling between two of its parts.

Vernier: A slow-motion device used on any variable instrument.

Volt: A unit of electrical potential.

Voltage: Amount of potential in volts.

Watt: A unit of power; equal to 1/746 horse power.

Wave Length: The distance between two consecutive points in the same phase; for example, from the crest of one wave to the crest of the next.

Wave Meter: A device calibrated to indicate wave length corresponding to radio frequency current applied to it.

Wave Train: A group of waves of decreasing amplitude.

Wave Trap: A device for eliminating interfering waves.

O.E.D.Jr.

RADIO COMPASS. See COMPASS; also RADIO COMMUNICATION.

RADIOLARIA, *ray dih o la' rih ah*, an order of minute one-celled animals found in the warm seas. They belong to the lowest branch of the animal kingdom (see PROTOZOA). Radiolarians have the body covered with a tiny shell of silica. After a radiolarian dies, its shell sinks to the ocean floor, and the accumulations of countless shells have caused the formation of thick layers of ooze in many parts of the sea. Fossil remains of these shells constitute a large part of the rock known as *tripoli*, and of *Barbados earth*, both of which are used as polishing powder. The name of the order has reference to fine threads of protoplasm which, projecting from the cell body through apertures in the shell, radiate in all directions.

S.H.S.

RADIOPHOTOGRAM, *ray dih o fo' toh-gram*. See PHOTOGRAPHY (Photography by Telephone and Radio); RADIO COMMUNICATION.

RADISH, a garden vegetable cultivated for the root, which is eaten raw as a relish or salad. The root is either carrot-shaped or round. The radish is related to the mustard, and above ground looks very much like it, except that the flowers are white instead of yellow. Radishes should be thinned to one in each two inches of the row, and are usually ready to eat about three weeks after planting.

B.M.D.

RADISSON, PIERRE ESPRIT (1635-1710), fur trader extraordinary, was born in Paris. His parents sailed for Canada and settled at Three Rivers in 1651. The following year his lifelong adventures began, among them exploits that resulted in the founding of the famous Hudson's Bay Company (which see).

RADIUM, a very rare and precious element, specially important for the intense radiations it continuously emits; symbol, *Ra*, atomic weight, 226, atomic number, 88. The discovery of radium marked an epoch in the progress of modern science. Aside from its practical use in medicine, radium is the key that has opened the door to reveal for the first time the inner structure of the atom. Its service to the advance of our knowledge of the nature of matter can not be overestimated.

Discovery and Occurrence. In 1898 Professor and Madame Curie and G. Bémont of Paris announced that they had succeeded in extracting from pitchblende a substance associated with barium which, weight for weight, gave off radiations far more intense than the rays from uranium, discovered by Becquerel in 1896. It was a happy inspiration that they named the new substance radium. Working with a ton of residues from pitchblende, they finally separated a few grains of nearly pure radium chloride, which, weight for weight, emitted radiations fully a million times as intense as the rays from uranium.

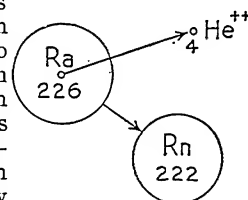
All minerals and ores containing uranium contain radium. In general, the ratio of radium to uranium is the same in natural minerals, namely, one part by weight of radium to 3,000,000 parts uranium. In a ton of high grade ore, 50 per cent uranium, only 150 milligrams of radium ($2\frac{1}{2}$ grains, or $1/200$ ounce) are present. The principal uranium-bearing minerals are pitchblende (uraninite), carnotite, and autunite. In pitchblende uranium occurs as the oxide, more or less pure; the ore is found principally in the Belgian Congo, in Bohemia, and also in Northern Canada (Great Bear Lake region). In carnotite, vanadium is associated with uranium. This ore is of low grade, occurring in Colorado, Utah, and Australia. Autunite, a phosphate of uranium, is found in Portugal. Until 1922 Colorado carnotite was the principal source of radium. When radium produced from the high grade pitchblende deposits in Belgian Congo came into the market, the American radium plants were forced to shut down. The price of radium dropped from \$110 per milligram to \$70 (a milligram is $1/28,000$ ounce, and in the late 1930's to \$25).

Chemical Properties. Radium is a silver white metallic element, difficult to isolate. In 1900 Madame Curie succeeded in isolating a tiny globule of the metal by electrolysis. Radium is generally sold in the form of the chloride or the bromide, mixed when impure with the barium salt. In radium sales a milligram, however, means a milligram of the element. A milligram of radium in the form of anhydrous bromide actually weighs 1.7 milligrams. The common compounds of radium are white solids resembling salt.

Radium behaves chemically exactly as would be expected of an element belonging to the alkaline earth family, including calcium, strontium, barium, and radium. Barium resembles it most closely, but barium does not emit radiations. Since the study of radium centers about the radiations that it emits, it is not surprising that its chemical behavior has not aroused much interest. The atomic weight of radium, however, has been accurately determined by Hönigschmid and found to be 225.97. The valence is 2, and the formula for the bromide is $RaBr_2$.

The Disintegration of Radium. Radioactive elements, as described in the article on Radioactivity (which see), emit radiations. The alpha ray, or alpha particle, emitted by radium, has been found to be a material particle—an atom—the helium nucleus, which is expelled from the center of the radium atom with the almost incredible velocity of 10,000 miles per second. In contrast to this terrific speed the half mile per second travel of a bullet from a high power rifle is a mere snail's pace. The alpha particle is the most powerful agent in the service of science. We speak of the expulsion of an alpha particle by saying that the radium atom disintegrates, and forms a new atom. This change within the atom may be pictured by the diagram shown on this page. The diagram shows that an atom of radium is transformed into two new atoms, one of which becomes the helium atom, and the other is a new element, formerly called radium emanation, but now called radon. Not all of the atoms in a given sample of radium break up at the same instant of time; only about one in 100,000,000,000 atoms breaks up each second.

The rate at which disintegration takes place proceeds according to a definite plan. Radium disintegrates at the same rate at the temperature of liquid air, and at the temperature of the electric arc. It takes place at the same rate in radium chloride as in radium sulphate. What is the rate of transformation of radium? We may state it this way: One half of a given sample of radium changes into new products in 1,600 years; in the course of the following period of 1,600 years, one half of the remainder of the sample of radium disintegrates, and during the next half-life period of 1,600 years, one half of the remaining atoms disintegrate, leaving only one-eighth of the original number, and so on. It appears then that radium is an element not endowed with life everlasting, as are the ordinary elements. Yes, radium has a transient existence.



RADIUM DISINTEGRATION

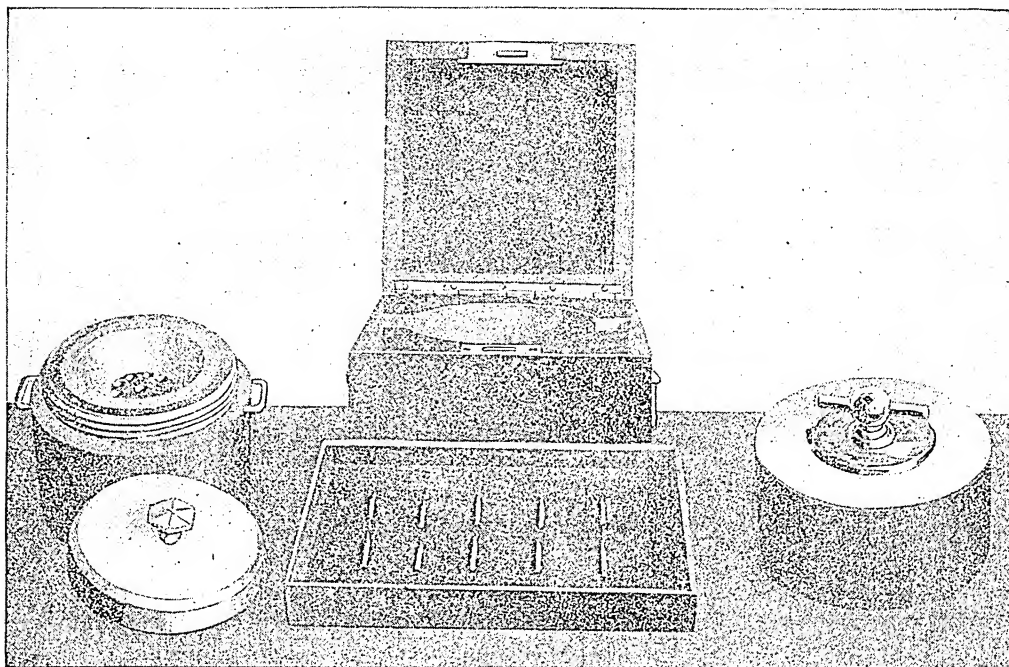


Photo: U & U

THE GIFT OF RADIUM TO MADAME CURIE

Photograph of the mahogany and gold container, lead-lined, in which is contained the gram of radium presented to the great woman scientist by the people of the United States. In the tray in the illustration are displayed the ten tubes of the rare element. These are preserved in the box at the left; when covered, it is placed in the square box at the rear and still another cover encloses it before the square lid is locked over the precious substance.

How is it then that old uranium minerals still contain radium? The answer is that uranium too is a radioactive element. Some of its atoms disintegrate, but the rate of disintegration is very much slower among uranium atoms than in the radium structure. About 4,500,000,000 years must pass by for one half of the atoms in a sample of uranium to be transformed into new products. While uranium atoms in breaking up do not form radium directly as a first offspring, nevertheless, radium is a lineal descendant of uranium, it being the sixth generation of atoms removed from uranium. Radium is a member of the uranium series of radioactive elements, numbering fifteen, the end member being stable radium lead. While some atoms of the radium contained in natural uranium minerals are decaying, the equilibrium ratio of about 3,000,000 uranium atoms to one atom of radium remains quite constant, new atoms of radium being supplied by the parent stock, uranium, as fast as the radium atoms beget new offspring. Eight of the disintegrations in the uranium-radium series of elements are alpha-ray changes. Since each alpha-ray change means a loss in mass of the parent atom of 4 units, 8 changes will reduce the atomic weight of uranium, 238, by 32 units, and thus leave

206 for the atomic weight of the lead resulting from the disintegration of uranium, a value which has been checked experimentally by the late Professor Richards and his students in the Harvard chemical laboratory.

A vast new field of research opened up in 1934 when Joliot and Curie, son-in-law and daughter of Mme. Curie, discovered artificial radioactivity. Upon bombardment with alpha particles, the light elements, lithium, boron, magnesium, aluminum, and others, became radioactive for a time, emitting from the nucleus positrons, neutrons, and electrons, with the production of new elements.

Radium Products. The name radium in its broader meaning includes, besides radium, the products radon, RaA, RaB, and RaC. Radium and its four products give off heat at the rate of 130 calories per hour per gram. One gram of radium, $1/28$ ounce, and its four products expel 4x37,000,000,000 alpha particles per second. A trace of radium mixed with phosphorescent zinc sulphide and made up into a paint is used in making luminous watch dials. The alpha rays from radium produce microscopic flashes of light which blend into a faint greenish light.

Radium in the Treatment of Disease. The beta and gamma rays make radium serviceable

in the treatment of cancer, tumors, certain skin diseases, and growths. Infected tonsils have cleared up and have been suppressed by proper radiation with radium. When so used radium or its product, radon, does not come in direct contact with the affected tissue. The radium is contained in sealed glass or metal tubes.

It is the field of radium therapy which demands that more radium be made available. A few hospitals located in the east—in New York and Baltimore—each have at least 5,000 milligrams of radium. Other sections of the country need two or three similar radium institutes.

Severe burns, much the same in character as X-ray burns, sometimes result from careless exposure to intense radiations from radium. The inflammation does not appear at once after exposure. Several days may pass by before the radiated tissue becomes inflamed. Bad burns often give rise to sores which are difficult to heal. These powerful effects may be prevented by the use of filters, proper dose of exposure, and other factors that experts in the field of radiology carefully heed.

Radium taken internally as medicine is deposited in part in the bone; and is spoken of as radium poisoning. The damaging effect is produced by the alpha rays.

Testing for Radium. When a coin or a key is placed on a photographic plate wrapped in black paper and then exposed to the radiations from radium, an image of the object will appear on the plate when it is developed. The rays from radium, especially the alpha rays, make the air in the vicinity a better conductor of electricity. We say the rays ionize the air. This electrical effect affords a rapid and accurate means of comparing the activity of samples of radium. The richness of a radium-bearing ore is determined by separating and collecting the radon in a weighed sample of ore, and then transferring the gas to a calibrated electroscope. From the observed discharge of the electroscope the quantity of radium in the ore may be computed.

Preparation of Radium. Radium is separated from the barium that must be present during the extraction to keep the radium from being washed away, by a process called fractional crystallization. A hot saturated solution of barium-radium chloride is prepared; upon cooling, about one half of the dissolved chloride crystallizes out, but about 80 per cent of the radium is now present in crystals; that is, the radium is enriched in the crystals. The mother liquor is then poured off. The crystals are dissolved in hot water, and the solution again cooled. By repeating this operation a number of times, crystals of pure radium chloride are finally obtained.

Refined radium is generally sealed in small glass tubes. The quantity of radium (element)

contained in a tube of radium is determined by comparison of its gamma radiation with that of a tube of pure radium bromide kept as a standard in the United States Bureau of Standards. For shipment, the tubes of radium are enclosed in heavy walled tubes of lead (see illustration). The amount of radium produced up to this time (1937) should not exceed 900 grams (about 1.9 pounds). See RADIOACTIVITY. H.Sch.

RADIUS. See CIRCLE.

RADIUS, in anatomy, the large bone of the forearm. See BICEPS; ARM.

RAEBURN, SIR HENRY (1756-1823), Scottish portrait painter born at Stockbridge, lived in Edinburgh after 1787. Following several years as a jeweler's apprentice and miniature painter, he turned to portraiture. With meager instruction, he became one of the greatest portraitists, and founder of the Scottish school. Numbering over 700, his canvases are realistic, vigorous, and surprisingly modern.

RAEMAKERS, LOUIS. See NETHERLANDS, THE (Language and Culture).

RAFFIA, the fiber from the leafstalks of a palm tree (*Raphia ruffia*) is found in abundance on the northeastern coast of Madagascar. The fiber is pliable and easily dyed. The natives make practically all their clothes, as well as baskets, mats, and small fancy bags, of raffia fiber. Raffia is exported in large quantities. It is also used extensively in greenhouses as a wrapping to protect plants and young trees from bruises or cold, and to tie buds and grafts (see GRAFTING).

Use in Schools. Raffia is used for weaving in many schools. Two exercises are given here:

Exercise 1. To make a very useful holder for a ball of twine, the only necessary articles are eighteen long, smooth strands of raffia; a pencil, or round, smooth

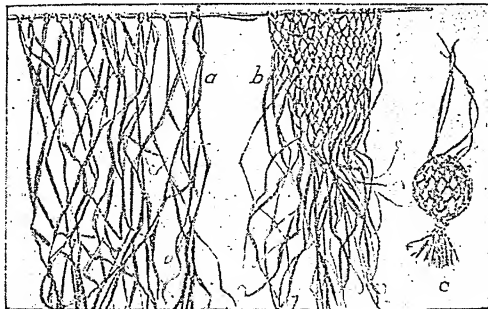


FIG. 1

Letters are explained in the text.

stick; and a pair of scissors. Place the ends of one strand of raffia together, thus making a loop at the center. Hold the stick horizontally in the left hand; then bring the loop over the top of the stick from the back, and pass the two ends up through the loop, pulling them down until the loop is held tightly against the stick (Fig. 1). In the same way, loop the

other seventeen strands on the stick (a). Now these strands must be knotted together. Beginning at the left, leave one strand hanging free. Knot the second and third strands. Hold the two strands together, bring the ends up and around to the back, across the

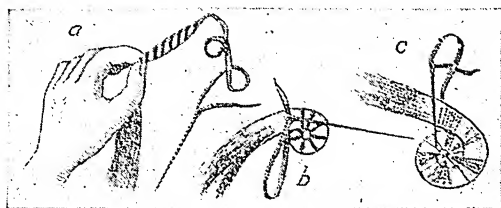


FIG. 2

Letters are explained in the text.

back of the two strands, and through the loop to the front; then pull the ends down into place. The knot should be about one-half inch from the pencil. Continue in the same way with the fourth and fifth strands, the sixth and seventh, etc. One strand will thus be left hanging free on the right side, corresponding to the one on the left.

In knotting the second row, leave two strands free on each side. For each row of knots, leave another strand free at each side until the knots form a V-shaped net. Now slip out the stick from the loops, and in its place, pull through several strands of raffia braided together. Next knot together the first loose strand at the right with the first loose strand at the left; then the second pair; and so on until the loose strands are all knotted (b). Nothing remains now but to close up the bottom of the holder by tying it with a strand of raffia. Then cut the ends of the strands to a uniform length. The result is a useful and ornamental article (c). Similar bags may be made by knotting—for example, a workbag.

Exercise 2. To make a simple mat, first select ten to fifteen strands of raffia to form the rope or filling. Fig. 2 shows the processes. Coil the large end of the strands as illustrated (a), beginning about an inch from the end with a strand of raffia already threaded through a needle. Then turn the coil on itself, and put the needle directly through the coil, and sew through the rope, as shown in (b). Then wind the rope with the threaded strand for about one-third or one-fourth of an inch; sew again through the rope. The stitches must be kept pointing toward the center, as in (c). The closer the stitches and the more tightly wound the coil, the stronger will be the mat. As the strands of the rope grow smaller, a few threads may be added at a time, and wound carefully to conceal the ends. To finish the mat, let the coil of strands gradually thin out, so the end may be as inconspicuous as possible.

Such a mat may be used as the bottom of a basket. It may be varied by using colored strands in simple patterns. As the children grow older and more expert, complicated patterns may be used. B.M.D.

RAFFLESIA. See FLOWERS (Strange and Unusual Flowers).

RAGNAROK. See MYTHOLOGY (Norse).

RAGTIME. See MUSIC (A Course of Lessons: Measures and Time).

RAGWEED. There are several different weeds of the composite family known as rag-

weed. The common ragweed, also known as bitterweed, hogweed, and Roman wormweed, is the plant whose pollen is responsible for a large number of cases of hay fever. This is a familiar roadside weed of the United States and Canada, and a common pest in pastures, grainfields, and cultivated fields. Its much-branched, hairy stem reaches a height of three to five feet. The leaves are thin, very finely cut, and hoary below; the fruit is very small and equipped with six sharp spines. Ragweed is fought as a nuisance by most farmers, but it is sometimes used as winter hay. Another familiar species is the great ragweed, or king-head, a coarse plant that sometimes grows twelve feet tall. It has a stout, hairy stem and large, three-lobed leaves very deeply cut. B.M.D.

Classification. Ragweeds belong to the genus *Ambrosia*, family *Compositae*. The common ragweed is *A. artemisiifolia*; the great ragweed, *A. trifida*.

RAHWAY, N. J. See NEW JERSEY (back of map).

RAIKES, rayks, ROBERT (1735-1811), the founder of one of the most influential religious institutions of modern times—the Sunday



Photo Brown Bros.

STATUE OF ROBERT RAIKES

school. He was born in Gloucester, England, where, from 1757 to 1802, he published a newspaper called the *Journal*. Raikes was a pioneer in the movement to better conditions in the jails; his first Sunday school, opened in 1780, was designed to help the children of the

poor. For the growth of this movement, see SUNDAY SCHOOLS.

RAIL, the common name of a family of

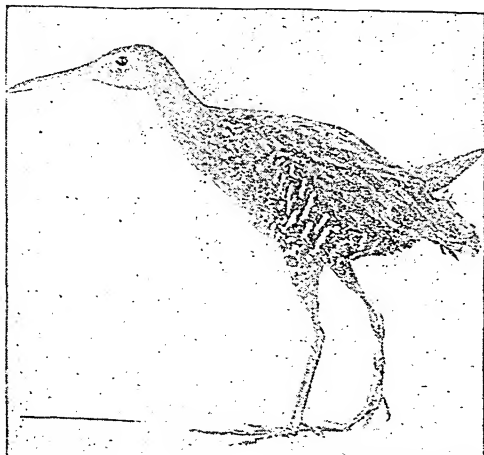


Photo: Visual Education Service

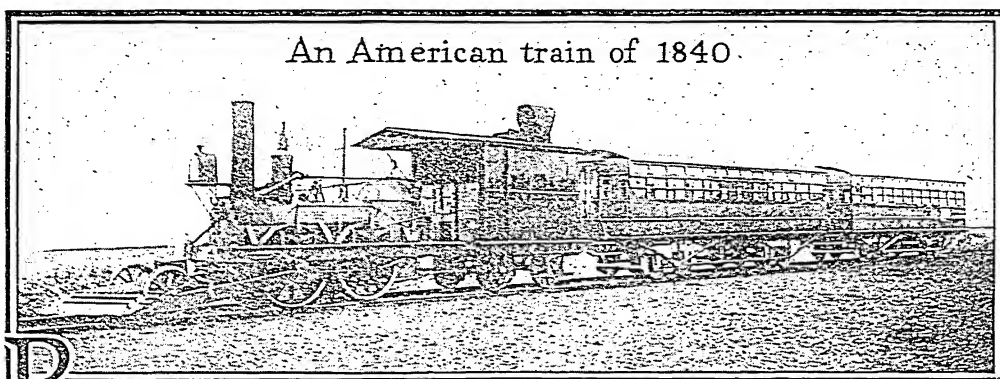
THE KING RAIL

marsh birds distributed over most of the world. The family comprises the rails proper, the

gallinules, and the coots (see GALLINULE; COOT). The birds known as rails frequent grassy marshes, where they run swiftly over soft mud, seeking worms, insects, shellfish, floating seeds, and plant sprouts. They have compressed bodies, short wings and tails, long legs and toes, and loose plumage of mingled brown and gray. When pursued, they seek safety by running and hiding, taking to flight only as a last resort, and then flying heavily and soon dropping to cover. Rails build their nests of grasses on the ground. Their eggs number from seven to fifteen, and are usually buffy-white, speckled with reddish-brown.

The rails most common in Europe are the *water rail* and the *corn crane*, or *land rail*, which frequents fields. In America are found the *king rail*, *yellow rail*, *clapper rail*, *Virginia rail*, *sora rail*, and others. The species vary in length from five to eighteen inches. Some of them, especially the *sora*, are much sought by hunters throughout their range. D.L.

Scientific Names. The rail family is called *Rallidae*. The king rail is *Rallus elegans*; the clapper, *R. longirostris crepitans*; the Virginia, *R. virginianus*; the yellow, *Porzana noveboracensis*; the sora, *P. carolina*.



RAILROAD, OR RAILWAY. More than half a century ago, when traveling by train was still a novelty, John G. Saxe wrote his famous *Rhyme of the Rail*:

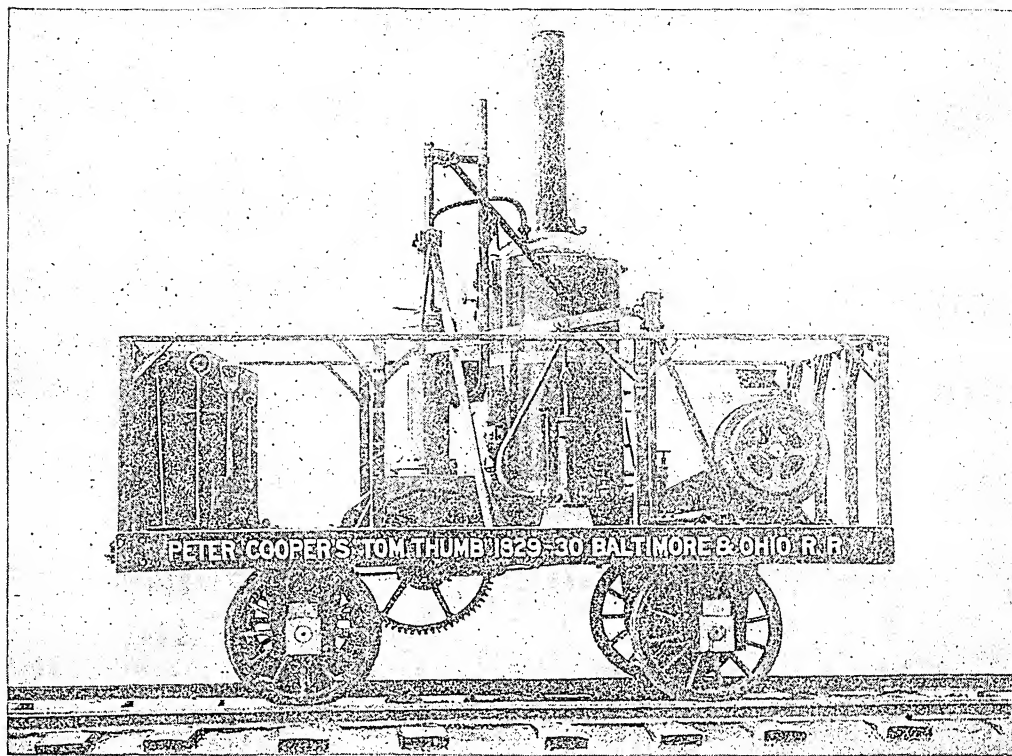
Singing through the forests,
Rattling over ridges,
Shooting under arches,
Rumbling over bridges,
Whizzing through the mountains,
Buzzing o'er the vale,—
Bless me! this is pleasant,
Riding on the Rail!

Poets to-day find riding on the rail too prosaic a theme for verse, but perhaps one of them will some day tell in song what the railroad means in the daily lives of men.

It is interesting to consider what the history of the United States and Canada would have been without the bands of steel which bind

their parts together. It is likely that, without railroads stretching all the way between the two great oceans, the United States would never have remained one indissoluble union of states; what is now the American republic would probably have become two or more independent countries. The same statement applies to Canada. British Columbia, for example, would not have joined the Dominion of Canada had it not been promised a railroad to connect it with the proposed sister provinces in the East.

This intimate connection between railroads and the national life has long been recognized by statesmen. After the first crude railroads were in operation, it became apparent that they were destined to be the means of development of vast territories, and governments either gave aid to railway companies, or them-



THE "TOM THUMB," CONSTRUCTED BY PETER COOPER
[See article COOPER, PETER, page 1661.]

selves undertook the task of building, in some cases operating the lines which they owned, in other cases leasing them to corporations. Later came the realization that private companies, which, because of their service to the public, had received the privilege of *eminent domain* (the right to purchase any land necessary for their lines) and other favors, were under obligations to the public. From this view resulted the era of railroad regulation.

Had there been no railroads, only those farmers who were fortunately located near navigable rivers or canals could have raised produce in excess of family needs and disposed of it at a distance, for profit. Most farming districts would have been largely self-sustaining; they would have produced on their lands practically everything necessary to life. Lands twenty-five miles from rail facilities, no matter how fertile, are known to possess little value; a new railroad within three or five miles of a farm vastly increases values, because of ready access to markets for crops in excess of home needs.

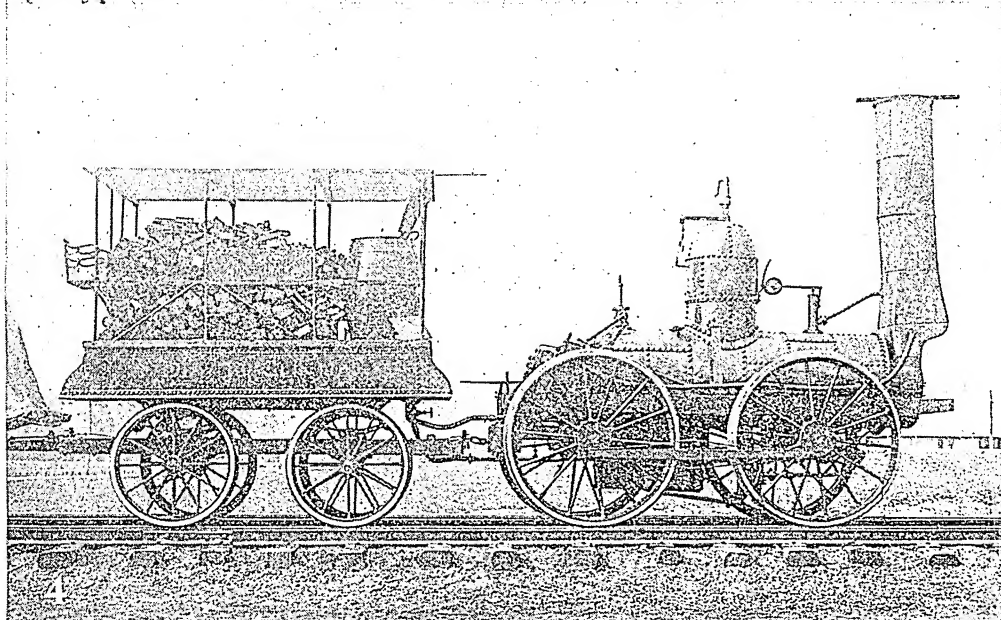
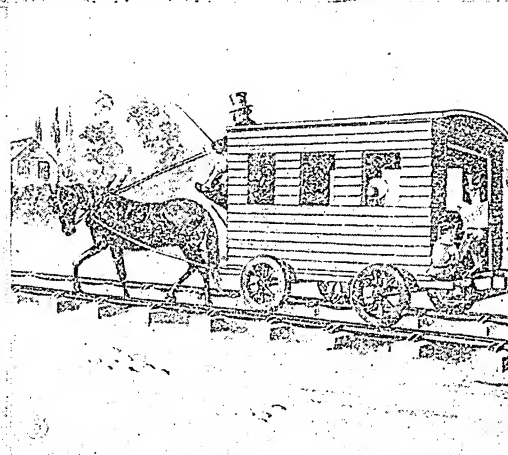
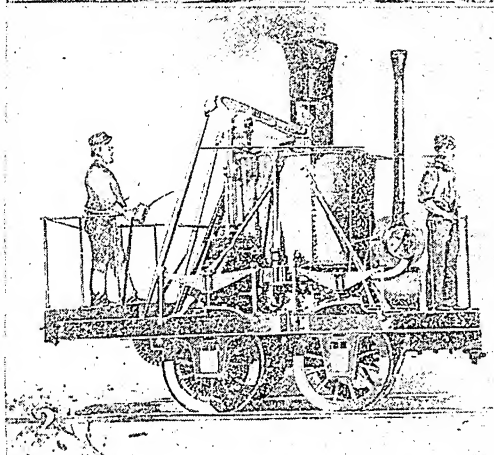
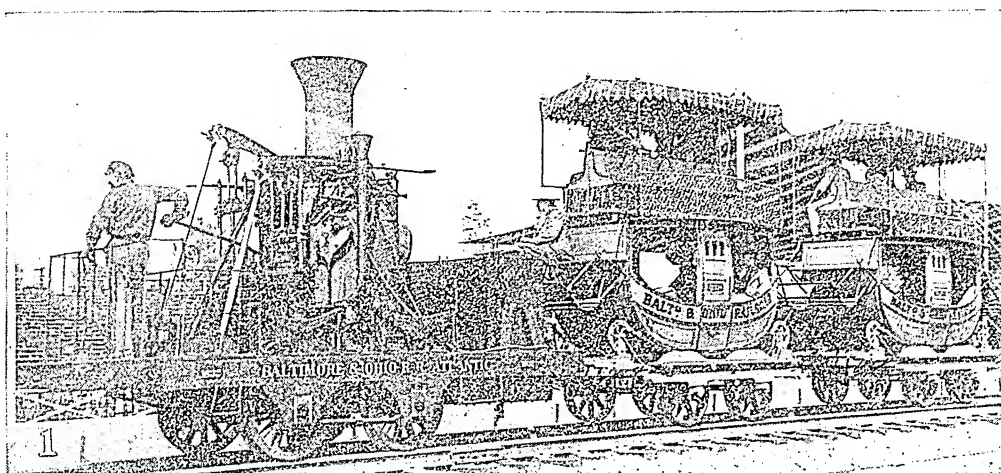
Without railroads, factories would have been even more limited than farms, and most of the wonderful mineral wealth of the continent would have lain untouched, for it would have cost more than the value of the iron, copper,

or coal to bring them to market by slow, tedious, and expensive methods.

The people of one section of the country would have been strangers to their fellow citizens of another; after a time it would have been impossible to hold them all under one government. Easy communications which railroads provide are socializing factors beyond the comprehension of people who never have been deprived of them.

Early Railroads. The railway had its humble origin in the coal mines of England, where, for several centuries, timbers were laid lengthwise for the wheels of the carts to run upon. Flanges were nailed to the wooden runways to keep the cartwheels on the tracks. Later, the flanges were made a part of the wheels, as we see them to-day. In time, the timbers were covered with iron, and before the nineteenth century, were replaced by cast-iron rails.

The first locomotive to run on rails was invented by Richard Trevithick, in England, but its many imperfections soon condemned it. An improved locomotive was designed in 1813, by William Hedley, for use in the English coal mines; he named it the "Puffing Billy," for it was noisier than its forerunners. The first locomotive which gave hope of practicability was built in 1814 by George Stephen-



Photos: U & U; P & A

Marvels of One Hundred Years Ago. At top, the pride of the Baltimore & Ohio Railroad in 1832; a passenger train drawn by the "Atlantic," the finest locomotive of that day. Below, at left, a sister engine of the "Atlantic"; at right, the first Baltimore & Ohio passenger car (1830). At the bottom, the famous "De Witt Clinton," first engine owned by the New York Central Railroad.

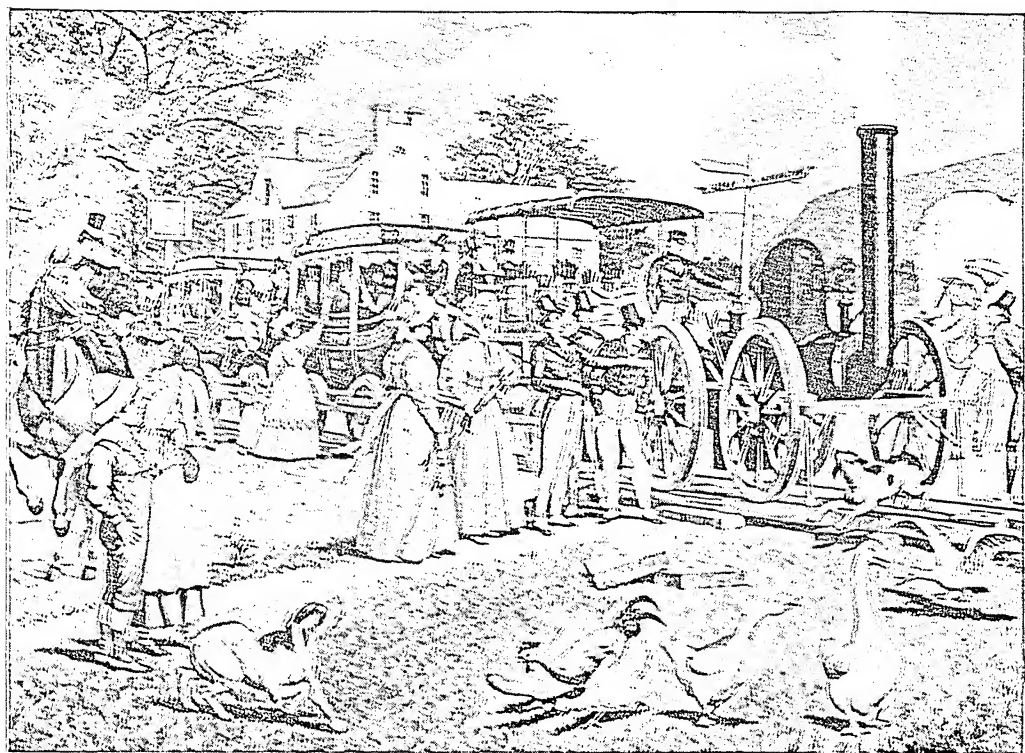


Photo: Visual Education Service

THE "DE WITT CLINTON" TRAIN

Photograph from a rare engraving hanging in the offices of the New York Central Railroad.

son. It ran on a tramway from a coal mine to the sea, a distance of nine miles, and its rate of speed did not exceed that of a walking horse. But in 1825 Stephenson so improved his machine that he has been honored ever since as the "father of the modern locomotive." In this design, Stephenson sent the exhaust steam up a chimney and induced a draft in the firebox, which intensified the heat. He followed this success in 1829 with the famous "Rocket," in which he employed tubes in the boiler, greatly multiplying the heating surface; this was the principle adopted for all locomotive-building from that time onward, and the advent of the "Rocket" marked the beginning of railroads.

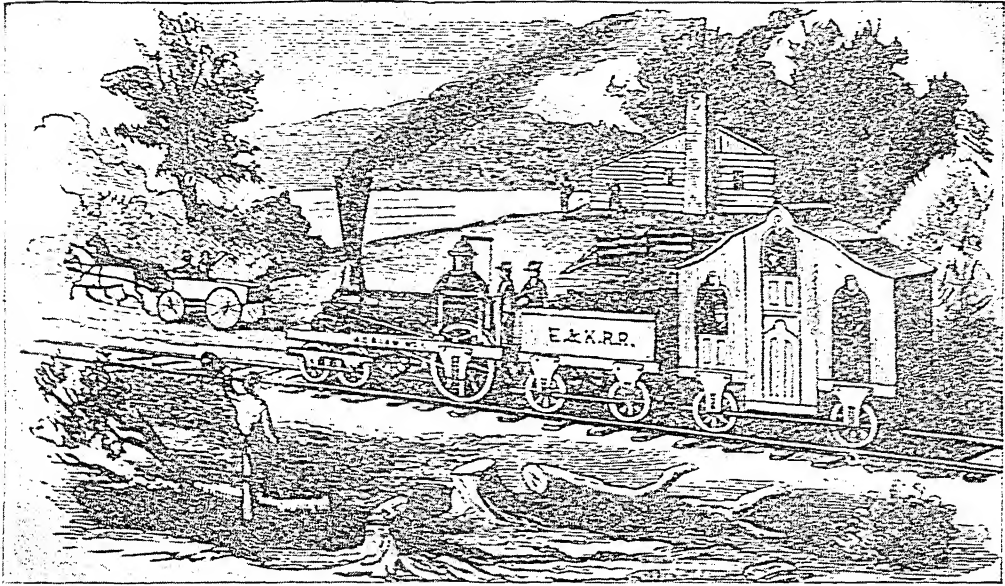
Railroads in the United States. The first railroad in the United States constructed for the purpose of carrying passengers and general freight was the Baltimore & Ohio, chartered in 1827, and opened for traffic, on a thirteen-mile stretch, in 1830. This road has since become one of the great transportation systems of the country. The Baltimore & Ohio, when first constructed, employed horse-drawn cars. The first railroad to adopt steam engines was the South Carolina Railroad, which began trial trips of the "Best Friend," the first practical locomotive built in the

United States, late in 1830. In 1833 the South Carolina Railroad, running between Charleston, S. C., and Savannah, Ga., a distance of 137 miles, was the longest line in the world under one management. From these humble beginnings the railroad systems of the country developed so rapidly that within fewer than a hundred years they were operating enough trackage to extend more than ten times around the earth at the equator.

Transcontinental Lines. There are six so-called transcontinental lines; they do not cross the continent, as the name implies, but they extend from the region of the Mississippi River to the Pacific coast, and they connect with lines from the Atlantic seaboard.

When engineers undertook the first surveys to find passes through the mountains, the country was a wilderness between Missouri and California. The difficulties were twofold—physical and financial—and they were enormous. In no department of its industrial life has America produced men of keener constructive vision than the pioneer builders of its railroads. They literally created a civilization where the Indian and the prairie dog alone had flourished.

The discovery of gold in California gave an impetus to projects for rail lines to the west-



FIRST TRAIN ON THE ERIE & SACRAMENTO RAILWAY

The locomotive is the "Adrian No. 1," named for Adrian, Mich., the largest village through which the road ran in the early 1850's.

ern coast. As early as 1833, Congress ordered surveys, but private capital was difficult to obtain for a venture so dubious as that of building a railroad through thousands of miles of uninhabited country. Moreover, the financial crisis of 1837 and the outbreak of the War of Secession temporarily interrupted industrial progress. Finally, the government came to the assistance of investors with generous gifts of land and government credit. With this encouragement, the first transcontinental line, composed of the Union Pacific, from Omaha to Ogden, Utah, and the Central Pacific, from Ogden to Sacramento, Calif., was opened to traffic in 1869.

As stated above, there are now six transcontinental lines. These are the Northern, Topeka & Santa Fe, from Chicago to Los Angeles and San Francisco; the Chicago, Milwaukee, Saint Paul & Pacific, from Chicago to Seattle; the Great Northern, from Saint Paul to Portland and Seattle; the Northern Pacific, from Saint Paul to Portland and Seattle; the Southern Pacific, from New Orleans to Los Angeles and San Francisco; and the Union Pacific, from Omaha to Ogden, with a south-westerly extension to Los Angeles and a north-westerly extension to Portland and Seattle.

The other leading railroad systems, some of which are larger than the aforementioned transcontinental lines, are the Atlantic Coast Line; Baltimore & Ohio; Chesapeake & Ohio; Chicago & North Western; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific; Illinois Central; Louisville & Nashville; Mis-

souri Pacific; New York Central; New York, Chicago & Saint Louis; New York, New Haven & Hartford; Norfolk & Western; Pennsylvania; Saint Louis & San Francisco; Seaboard Air Line; and Southern Railway. There are altogether 136 railroads of the first class in the United States; that is, roads with operating revenues in excess of \$1,000,000 a year. There are also many shorter lines of more or less importance.

America Compared with Europe. The railroads of the Old and of the New World differ from each other as widely as their people. In Europe, rail transportation has served chiefly to bring together regions already populated, but in America it has made possible the rapid settlement of millions of square miles of previously undeveloped land. The early European builders had plenty of capital and were assured of ample revenue; their American contemporaries could obtain little money for early construction work, and they knew that they must build up the territory served before they attained earning power. As a result, European roads were constructed more carefully, and without the sharp curves and heavy grades of American lines. American locomotives and cars had to be built to turn on these curves and to climb these grades, and since there were as yet no standard types of equipment, a striking contrast developed between the appearance, size, and strength of American and of European rolling stock.

A journey by train anywhere in Europe is a different experience from one in America. The

ordinary type of European car is much lower and smaller than any American car, and is divided into compartments, each of which accommodates from six to ten passengers. Each compartment is first, second, third, or fourth class, according to the fare paid and the degree of comfort provided. Some railroads have adopted cars with a narrow passageway along one side, like that beside the smoking compartment in a Pullman car. Sleeping cars are nearly all of this type; they accommodate only about half as many travelers as an American sleeper of the same length, but afford greater comfort and privacy. First-class sleepers are luxurious, and proportionally expensive. A passenger may rent a pillow and a blanket and pass a comfortable night in an ordinary compartment coach. A few roads operate standard Pullman cars.

Dining cars offer only regular course meals; one cannot order promiscuously. On some roads, elaborate dinners extend to ten courses. When trains are crowded, passengers are given tickets, which permit them to eat in relays and on schedule.

The nature of the freight which railways carry has had much to do with the evolution of their equipment. In America, trains haul a large amount of raw material and large freight cars are the rule. The European cars, built to carry manufactured goods short distances, can transport only ten tons, while the freight cars in the United States and Canada carry nearly fifty tons.

Modern Developments. Within recent years development in railroad passenger service has included air conditioning and streamlined trains. Using the principles of aeronautics,

designers removed all projections from a train; the result is a tube constructed of a light metal, such as aluminum alloy or stainless steel. Streamlined trains are usually powered by diesel engines. In 1934 a streamlined locomotive was introduced.

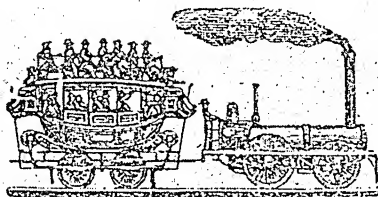
Modern Railroad Construction. Under the heading **BRIDGE**, in these volumes, will be found a picture of the Tunkhannock Viaduct, a concrete structure 242 feet high and half a

mile long, built to make possible the shortening of a route by three and a half miles, and to effect the elimination of certain grades and curves. The cost of this bridge and cut-off was \$12,000,000, so it is evident that the directors of the railroad believed they would save each year in operating costs at least half a million dollars, the amount they would have to pay in interest on the money borrowed to build it. This is but one instance of many in which millions of dollars have been expended to lower operating costs and to shorten time schedules. Anyone who has operated an automobile appreciates the fact that it requires as much power to turn a corner as it does to climb a slight hill. The steepest grade up which a

locomotive can haul a load is one which rises but five feet in every hundred, and few roads have grades of more than one or two per cent, so it is plain that curves are quite as much to be avoided as grades.

Railroads in America are now being constructed with lower grades and more gradual curves than those existing on older lines. An excellent example of this is a comparison of the three Canadian transcontinental lines. On the Canadian Pacific, the oldest line, trains go-

ADVERTISEMENT.



TO EMIGRANTS AND TRAVELERS.

The Erie and Kalamazoo Railroad is now in full operation between

TOLEDO AND ADRIAN.

During the ensuing season trains of cars will run daily to Adrian, there connecting with a line of Stages for the West, Michigan City, Chicago & Wisconsin Territory.

Emigrants and others destined for Indiana, Illinois and the Western part of Michigan

Will Save Two Days

and the corresponding expense, by taking this route in preference to the more lengthened, tedious and expensive route heretofore traveled.

All baggage at the risk of the owners.

EDWARD BISSELL,) Commissioners
W. P. DANIELS,) E. & K. R. R.
GEORGE CRANE,) Co.

A. HUGHES, Superintendent Western Stage Company.

Photo: Visual Education Service

AN ADVERTISEMENT IN PIONEER DAYS

This railroad at the time was less than thirty-five miles long. Authorities declare that the coach is not authentic, for the woodcut was borrowed from an Eastern railroad. The type of coach of the Erie & Kalamazoo is shown in another illustration in this article.

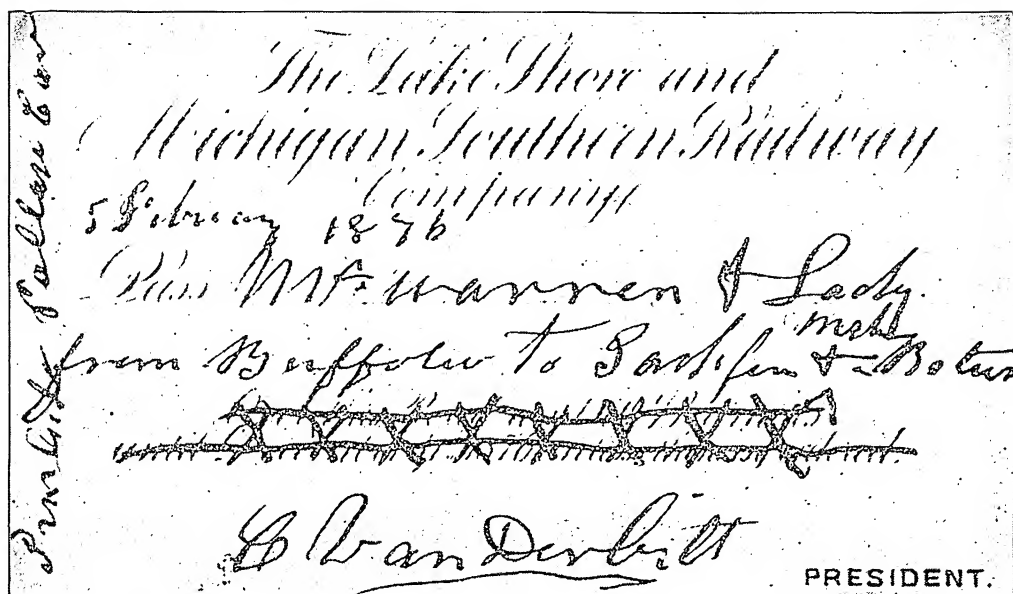


Photo: U & U

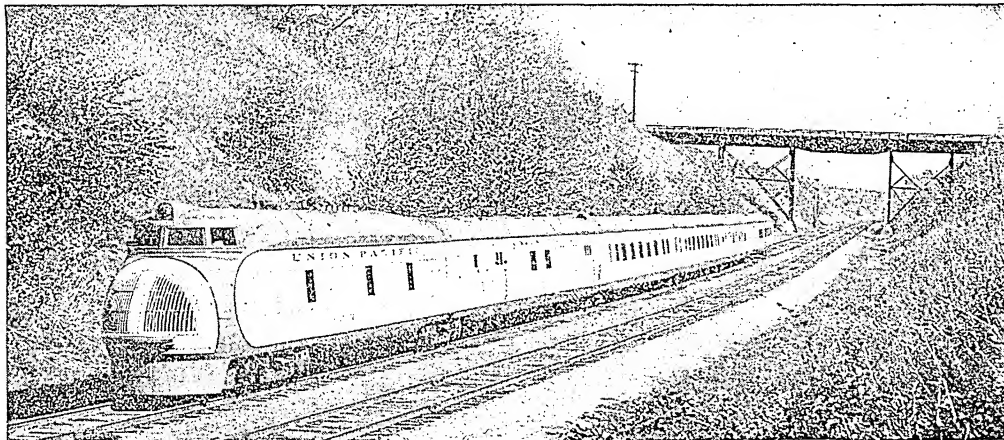
A RAILROAD PASS SIGNED BY COMMODORE VANDERBILT

"Pass Mr. Warren and Lady from Buffalo to Jackson, Mich., and return." A special decree written on the margin by Vanderbilt made the pass valid on sleeping cars.

ing either to or from the Pacific coast must climb some grades of 2.2 per cent. On the road formerly known as the Grand Trunk Pacific, the youngest of the three, now a part of the Canadian National Railways, the heaviest grade for westbound traffic is 0.5 per cent, and for eastbound it is 0.4 per cent. The former Canadian Northern has westbound grades of 1.0 per cent on stretches of line which were built some years ago, but on the newer stretches, through the mountains, 0.5 is the maximum. Eastbound, this same road has a few miles of 0.7 grade. The importance of the distinction between eastbound

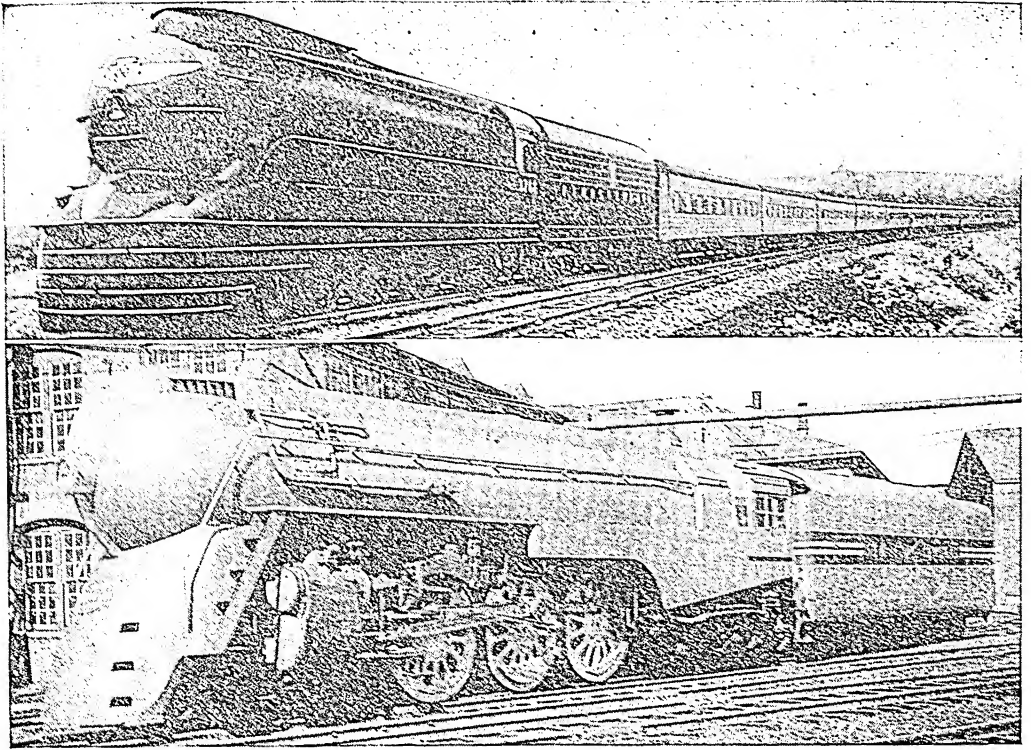
and westbound grades lies in the fact that on these roads the heaviest traffic moves toward the Atlantic.

The difference in sharpness of curves on the Canadian Pacific and on the former Grand Trunk Pacific is as striking as that in grades. The first-named road has some curves of 10° , while the latter has none of more than 6° . By a curve of 10° is meant one in which the line between two points 100 feet apart in a straight line is an arc of 10° , or $\frac{1}{36}$ the circumference of a circle. A 6° curve is therefore part of a much larger circle, for a chord of 100 feet marks only $\frac{1}{60}$ of the 360° in the cir-



SIX CAR STREAMLINED TRAIN

The first Pullman-equipped streamlined train in the United States was placed in service in 1934.



(ABOVE) THE BROADWAY LIMITED TRAIN; (BELOW) THE TWENTIETH CENTURY LIMITED LOCOMOTIVE

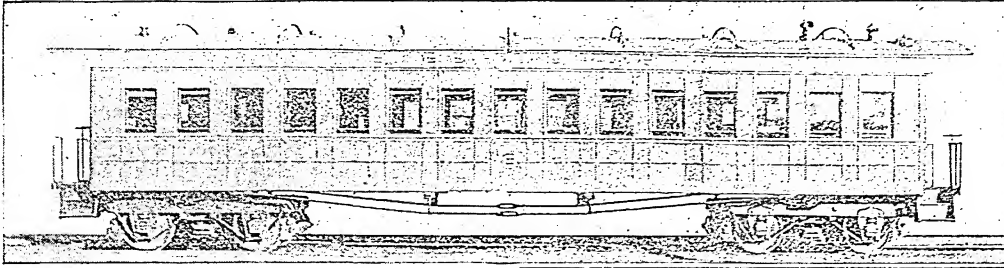
cumference. Were a Canadian Pacific maximum curve a little more than 3,600 feet long, a train would turn completely around, but on the other railroad, the curve would have to be over 6,000 feet in length for the same thing to happen.

The first steps toward building a railroad are the surveys. The first survey (sometimes unnecessary if accurate profile maps of the region exist) is to determine what route will serve the most profitable territory at the least expense of construction and operation; when the decision is made, the surveyors mark out the route, indicating by stakes exactly where the line is to run. The grade is then prepared and bridges are built, material is taken from *cuts*, and so far as possible turned into *fills* to eliminate depressions. On many lines, the *ties* and *rails* are put down by a track-laying machine, which can finish two or three miles of track in a day. On these machines, ties are automatically run on an endless chain, from the rear over its top and down an incline in front, to be dropped in their proper places on the roadbed. The track-laying machine advances as rapidly as the rails are put into position on the ties, and temporarily spiked down. Ties are, as a rule, rough-hewn timbers about nine feet long, six inches thick, and ten inches wide,

set across the track at intervals of two feet or less. On them rest the rails, which are commonly thirty-three feet long, and for first-class American railroads, weigh 60 to 110 pounds or more to the yard. *Ballast* consists of crushed stone, gravel, slag, cinders, or other material inserted beneath and between the ties to keep them in their proper place and to cushion the roadbed.

Almost all the railroads of the United States, Canada, and England are constructed according to *standard gauge*, with their rails four feet eight and one-half inches apart. *Narrow-gauge* roads are seldom found except in the mountains. In other countries, there are gauges of all widths up to six feet, so it is frequently impossible for the cars of one railroad to travel on the tracks of another. Many fantastic stories are told to explain how four feet eight and one-half inches came to be the standard gauge, but the most plausible explanation is that the early English coal cars measured five feet from outside of wheel to outside of wheel, each wheel being an inch and three-quarters thick.

Railroad Operations. About 1,500,000 people in the United States are normally employed on its railroads. Over half of these on any road are charged with responsibilities connected

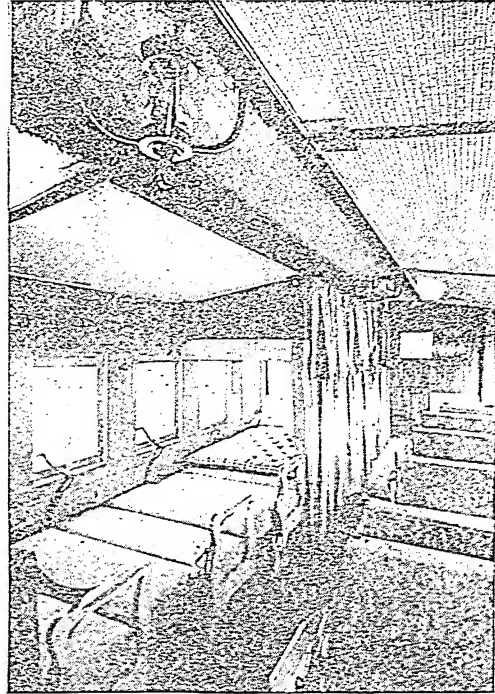


with the operation of trains—from the vice-president in charge of operations down to switchmen, who make up the trains, and section men, who keep in repair designated lengths of roadbed. While the wages of this army of workers are not all charged to operating expenses, yet the service rendered assures swift, safe, and comfortable travel.

A train dispatcher controls the movement of every train on a section of road assigned to him. He knows at all times where trains should be; their movements are recorded on a chart which is always before him. Orders are telegraphed or telephoned by him to train conductors. The conductor is responsible for the comfort of the passengers, and he is chief of the train crew, although the engineer, to whom he gives a copy of all orders from the dispatcher, is wholly responsible for the movement of the train. Signals which line the track are interpreted by him, and he translates their meaning into action.

Safety Devices. Possibly the greatest element of safety in train travel, next to proper physical condition of engine and cars, lies in the block-signal system. The laws of most states compel the installation of these signals, and many roads, even though not required to do so, have installed them for their own protection.

Each section of a road, called a division, from 100 to 200 miles in length, is divided into blocks (stretches of track) from one-half mile to two miles in length—the greater the amount of traffic, the shorter the block. Either electrically or by man power at levers in a tower house, signals are manipulated at the beginning and end of each block. In the daytime, these signals are wooden arms on high posts; the arms are called *semaphores*, and the position of a semaphore conveys a message to the engineer. If extended horizontally, it is a warning that there is a train ahead in the same block, and the engineer must not pass into the block until the train ahead has entered the next block. In long blocks, the semaphore may be found slightly lowered. In this case, the engineer may enter the block, from which the train ahead has not emerged, but he must use caution. If the semaphore is lowered—if it points downward—this informs the engineer that the block ahead is clear, and he may



FIRST PULLMAN SLEEPING CAR

The illustrations show exterior and interior views. The first trip of this car was made September 1, 1859.

drive his train forward at its usual speed. In the night, a green light indicates a clear block, a yellow light is a signal for caution, and a red light means stop.

If a line of road has a double track, or if there are four or more tracks, each track possesses its individual block signals; the engineer is interested only in the signals directly over the track on which his train is running.

Another device which is of the highest value, and which has increased safety to a degree beyond measure, is the air brake; this is described under its own title.

Transport Competition. With the advent of the motorbus, with the development of inland waterways, and with the multiplication of electric trolley lines, steam railroads have experienced serious loss of patronage, resulting in greatly decreased passenger revenues. Many thousands of people daily patronize these new means

of rapid transit. In many instances, railroads have discontinued some of their local trains, and have substituted motorbus fleets as feeders to their main lines. Moreover, the motor truck has cut into railroad-freight revenues, and accordingly a number of railroads have installed motor-truck service for short hauls from the terminals. Motorized service is increasing rapidly on many of the railroad lines.

Esch-Cummins Act. In 1920 the Congress of the United States passed the Esch-Cummins

plan. The Commission encountered great difficulties in working out a satisfactory plan of consolidation; the 1929 plan proposed consolidation of all roads into nineteen systems. Opinions differ as to whether it is desirable for the government to encourage railway combinations. Past policy, of course, has been one of opposition to consolidation; the Sherman Anti-Trust Act of 1890, as interpreted by the courts, forbids combinations in restraint of trade, including railway combinations. But the Esch-Cummins Act authorizes the Interstate Commerce Commission to permit carriers to enter into combinations; and when its sanction has been obtained, the prohibitions of the Sherman Act become inoperative as to the combination effected.

Government Ownership and Operation. In the United States there is a minority group which believes that the government, as soon as practicable, should own and operate all the railroads of the country. The government now owns and operates two railroad systems—one in Alaska, and one in Panama. During World War I, also, it operated most of the railroads within the country.

Many arguments can be advanced

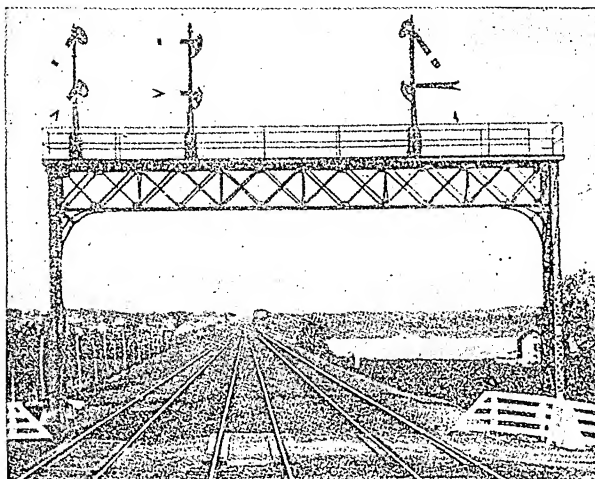


Photo: Union Switch & Signal Co.

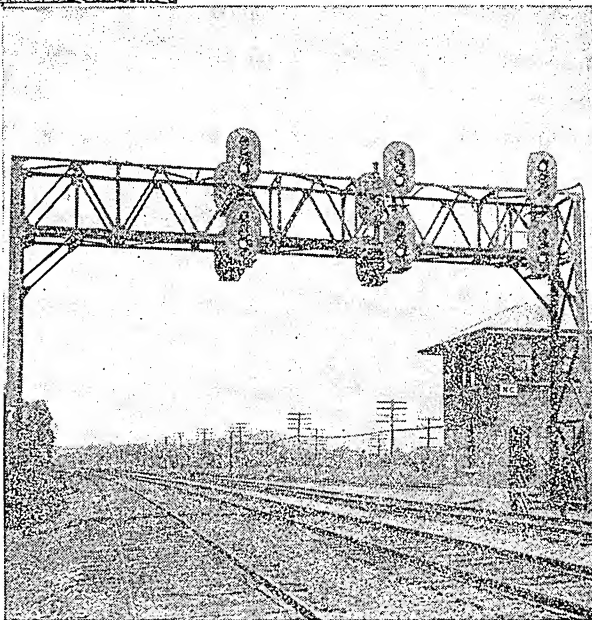
RAILWAY SIGNALS

Semaphore signals, *above*, are gradually being replaced by various types of color signals.

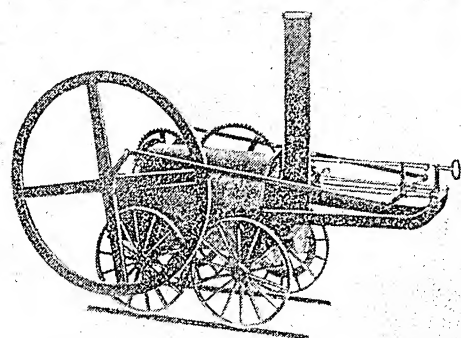
Right: A three-color light signal.

Act, now the principal Federal statute dealing with the regulation of railroads. This act provided that the railroads, which as a war measure had been operated by the Federal government since January, 1918, should be returned to the former owners. It greatly increased the powers of the Interstate Commerce Commission, the agency created by the Interstate Commerce Act of 1887 to regulate railways. The act of 1920 is generally known as the Transportation Act.

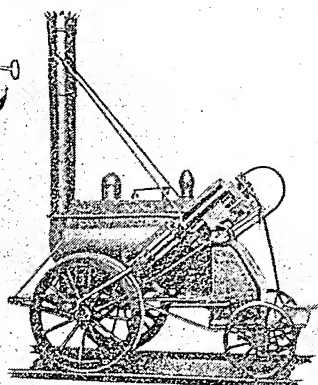
The Commission was empowered to initiate rates, as well as revise them when found unreasonable and discriminatory. It was directed not only to prevent rates from being unreasonable, but to see to it that they were adequate. It was given power to regulate the issuance of securities by railroad companies, and was given enlarged power over railroad service. It was required to prepare a plan for the consolidation of the railway properties of the country into a limited number of systems. The Commission published (in 1921) a tentative plan, and in 1929 it adopted a complete



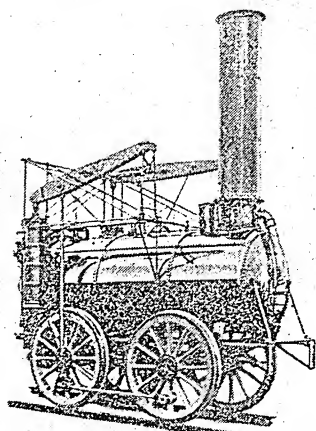
both for and against government ownership and operation. The government could obtain capital on better terms than privately owned railway companies do. It could effect certain savings, especially those resulting from a unified operation of the properties. Labor conditions



RICHARD TREVITHICK'S LOCOMOTIVE 1804

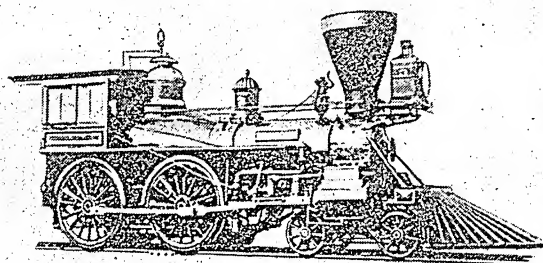


GEORGE STEPHENSON'S ROCKET 1829

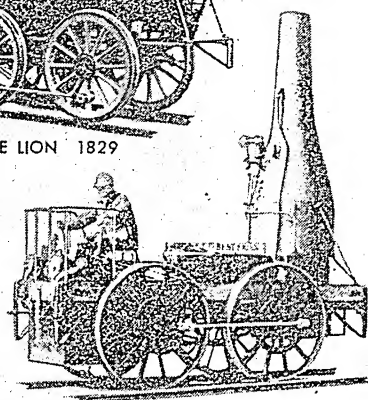


STOURBRIDGE LION 1829

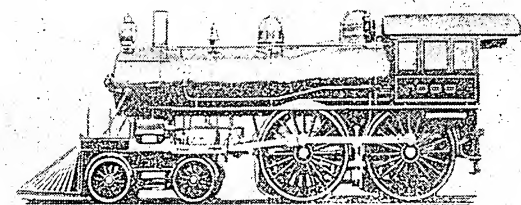
DEVELOPMENT OF THE LOCOMOTIVE



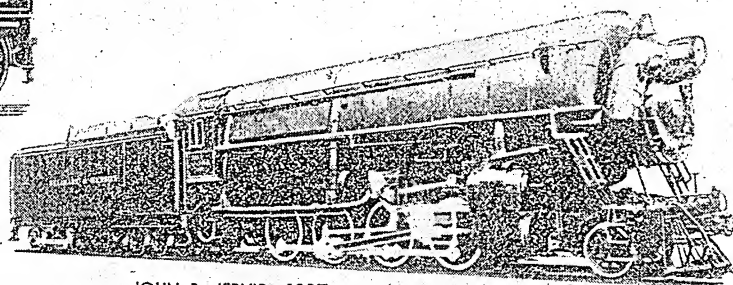
THE GENERAL 1855



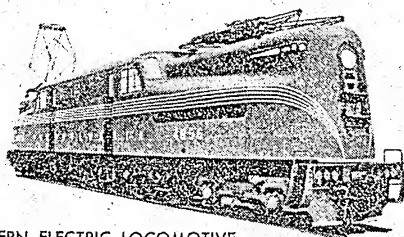
BEST FRIEND 1830



LOCOMOTIVE 999 1893

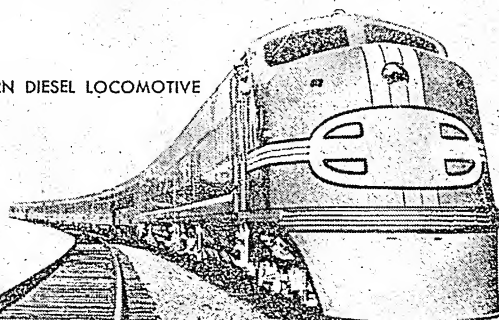


JOHN B. JERVIS 1927



MODERN ELECTRIC LOCOMOTIVE

MODERN DIESEL LOCOMOTIVE



would probably be better, and there would be less danger of strikes. There would be fewer discriminations in rates, and no railroad failures, causing great loss to security-holders.

On the other hand, private operation is undoubtedly more efficient, and rates will therefore probably be lower and service better if private ownership is retained. The railroads have made a splendid record since private operation was resumed in 1920.

Railroads of the World. The United States possesses a very large share of the railroad mileage of the world; in 1940, the lines operated by American railroads (including main and yard tracks and sidings) totaled 405,975 miles in length. Of the other leading countries, Soviet Russia had approximately 59,370 miles of railroads; Canada, 56,530; Germany, 42,300; India, 41,150; Australia, 27,230; France, 26,420; Argentina, 25,650; Brazil, 21,200; Great Britain, 20,080; Mexico, 15,040; Italy, 14,530; Union of South Africa, 13,230; Japan, 10,890; and Sweden, 10,470.

E.J.

Related Subjects. For further information on railroads, refer to the following articles. Reference is also suggested to the sections on *Transportation* in the articles on the various countries of the world.

Adamson Law	Eminent Domain
Air Brake	Interstate Commerce
Cape-to-Cairo Route	Act
Common Carrier	Locomotive
Diesel Engine	Monorail Railroad
Electric Railway	Transportation
Trans-Siberian Railway	

RAILROAD LABOR BOARD. See **ARBITRATION** (Industrial Arbitration).

RAILROADS IN CANADA. See **CANADA** (Transportation).

RAILROAD WORM. See **APPLE MAGGOT**.

RAILWAY EXPRESS AGENCY, INC. See **EXPRESS COMPANY**.

RAILWAYS, ELEVATED. See **ELEVATED RAILWAYS**.

RAIN. Shakespeare, in *The Merchant of Venice*, has a beautiful description of the quality of mercy, which, he says, is like the "gentle rain from heaven." Probably no phenomenon in nature has received more grateful tributes than the fall of rain, because upon it depend the comfort and happiness of mankind. This idea is expressed picturesquely in these lines of an old poem:

The pastures lie baked, and the furrow is bare.

The wells they yawn empty and dry;

But a rushing of waters is heard in the air,

And a rainbow leaps out in the sky.

Hark! the heavy drops pelting the sycamore leaves,

How they wash the wide pavement, and sweep from the eaves.

And deep in the fir-wood below, near the plain,

A single thrush pipes full and sweet,

How days of clear shining will come after rain,

Waving meadows, and thick-growing wheat;

So the voice of Hope sings, at the heart of our fears,

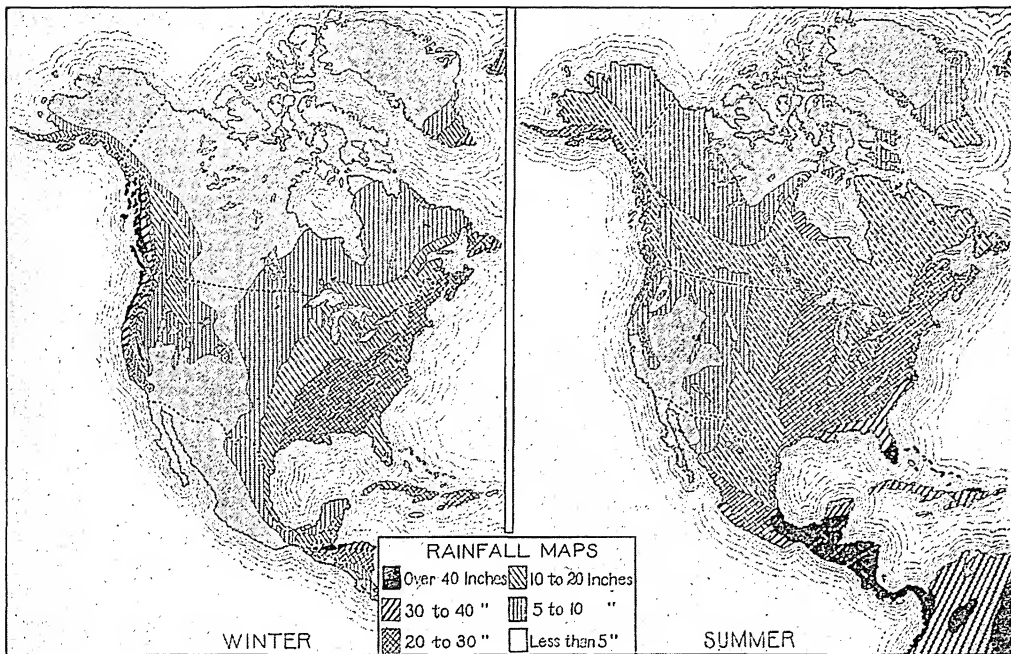
Of the harvest that springs from a great nation's tears:

O, the rain, the plentiful rain!

What Is Rain? A child who is asked this question will probably say that rain is water that falls out of clouds in drops. Such an answer would be correct, though it does not explain why the clouds form, or why they lose their moisture. The formation of rain depends upon several interesting processes in nature. Moisture is constantly being taken up into the air from the earth's surface, particularly the warmer parts of the ocean, by a process called *evaporation*. This moisture, called water vapor, is invisible; it is mingled with the other gases in the air and is carried upward by the wind. When the moisture-laden air is rising, it cools by expansion, at the rate of 1° F. for about every 180 feet of its ascent, until its temperature is the same as the original air; above this elevation, the vapor it contains condenses into tiny particles of water, so fine that they might be called *water dust*. This water dust is known as cloud or fog, according to whether it is high in the air or near the surface of the earth. A further cooling of the air will cause the minute cloud particles to condense and unite into drops so large and heavy that they fall by their own weight. Floating dust motes in the air have something to do with rain formation, for these tiny dust particles form lodging places for the condensing vapor, and, because they cool more rapidly than the air, they hasten the condensing process. The essential condition, however, is the reduction of the temperature to a point where the air can no longer hold the moisture it contains. When the air contains all the vapor that it can hold at a certain temperature, it is said to be *saturated*, or at the *dew point*. Rain occurs when the temperature falls below the dew point.

Raindrops and Their Work. Probably every one has observed that raindrops vary greatly in size and in the swiftness with which they descend to the earth. The largest drops that have been measured were about one-fourth of an inch in diameter, and traveled at the rate of from fifteen to twenty-five feet a second. The smallest drops measured were not more than one-twentieth of an inch in diameter, and fell at a much slower rate, probably about five feet a second. Raindrops, in falling, wash all sorts of impurities out of the air—dust, soot, pollen from plants, and many other solid substances. It has been calculated that a five days' rain in London, England, which is a very smoky city, and an area of great congestion, will wash from the air tons of solid impurities; fifty-five tons of soot and other impurities fall upon that city in a month.

Why and Where Rainfall Varies. It has already been stated that a great amount of moisture is evaporation from the warmer parts of the ocean. Consequently, tropical regions have, in general, a very heavy rainfall. A yearly average of 100 inches of rain might be



RAINFALL IN NORTH AMERICA, SUMMER AND WINTER

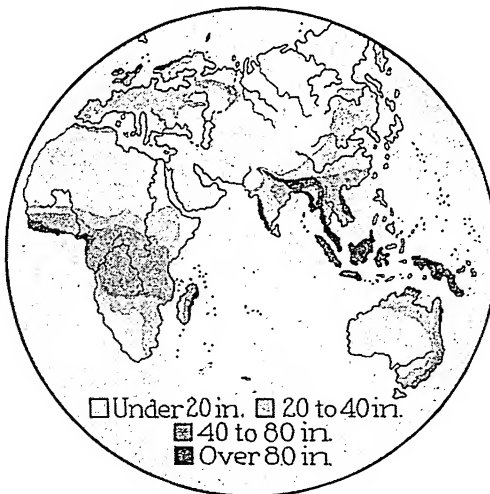
given for the tropics, one-third as much for the temperate zones, and one-eighth as much for the Polar regions. The actual variation, however, is far greater than this. The highest rainfall ever recorded for one year was 805 inches, in Assam, India, although the greatest number of storms per year do not occur there; the lowest was three one-hundredths of an inch, in Walfish Bay, on the west coast of Africa. These variations are due to a number of causes, the principal ones being the height of a given region above the sea, its distance from the sea, and the character of the land, whether barren or wooded. On slopes that are exposed to ocean winds, rainfall is generally abundant, while regions shut off from the sea by high mountain ranges are almost rainless.

Lands That Always Have Rains. The southern slopes of the Himalaya Mountains in India have the heaviest rainfall in the world, from 200 to 600 inches a year, because the warm winds from the Indian Ocean, heavily laden

with moisture, lose nearly all of it when they strike the cool mountain slopes. These mountains are very high, and on their northern slopes, the annual rainfall is less than ten

inches, because practically no moisture is carried across their tops. The vast Amazon region in South America, because it lies in the equatorial belt of ascending air, has heavy rainfall; the winds which mount the eastern slopes of the Andes still have moisture to give up, but they cannot cross the towering peaks; therefore the western slopes of these same mountains are more sterile. The winds blowing from the ocean, on the other hand, are too cool to bring rain.

A total of over 45,000 thunderstorms each day, or 1,800 an hour, is the record for the entire surface of the earth, according to recent computations based on years of observation at thousands of widely scattered stations. The island of Java is the world's most thunderous spot, with no fewer than 223 storm days each year.



RAINFALL IN THE OLD WORLD

Lunar Rainbow. Occasionally, there is visible a rainbow formed by the light of the moon. The feebleness of the light paints the luminous arc in very faint colors, difficult to observe. The lunar differs from the ordinary rainbow only in intensity of color. R.H.W.

[See the article SPECTRUM ANALYSIS, for illustrations of rainbow formation.]

RAINBOW BRIDGE. See MONUMENTS, NATIONAL; NATURAL BRIDGE.

RAIN CROW. See CUCKOO.

RAINFALL AND SOIL FERTILITY. See AGRONOMY; RAIN.

RAIN GAUGE, *gaje*, an instrument for collecting and measuring rain. There are numerous patterns of these instruments, but the simple rain gauge in use by the United States Weather Bureau is the most easily understood and operated. In shape it resembles a cylindrical pill box with a removable cover (see drawing). Inside is a smaller tube (*b*) which widens into a funnel (*a*) at the top. As the area of the funnel is ten times that of the tube, one-tenth of an inch of water falling into *a* fills *b* to a depth of one inch. When the tube is full, the surplus water overflows into the reservoir (*c*). With a rule divided into inches and tenths of inches, instead of halves, quarters, and eighths, the water in the tube *b* is measured. In case the fall of rain is so heavy that the water overflows into *c*, the water in *b* is poured out after measuring, and that in *c* is poured into the tube and measured. The sum of the two measurements is the amount of rainfall. The gauge should be set far enough away from buildings, trees, or other tall objects to prevent any obstruction of the rain.

Rain gauges are placed on the ground wherever practicable in order to escape the effects of wind, which is well known as the principal cause of deficient catch. However, they are sometimes placed on sheltered flat roofs of large buildings when ground locations are unavailable. These instruments permit the accurate compilation of data as to the rainfall of regions, and so aid in the determination of agricultural possibilities. See RAIN.

RAIN GOOSE. See DIVER.

RAINIER, *ra neer'*, MOUNT, a peak of volcanic origin, the highest in the state of Wash-

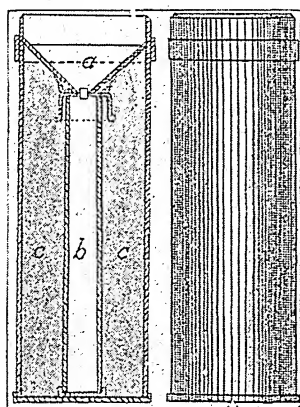
ington, called Mount Rainier by the residents of Seattle, and Mount Tacoma by those of Tacoma. An unsuccessful attempt was made in 1924 to change the official name to Tacoma. Fumes still issue from the imposing cone, but the deeply eroded slopes prove that the last eruption was at a remote period. The mountain is situated in Mount Rainier National Park. It is reached by automobile and stage lines, leading through splendid fir and cedar forests, past mountain torrents, and among patches of scarlet heather and white glacier lilies. The peak itself is 14,408 feet above sea level. Travelers usually ascend from the south to the end of the timber line, a height of about 5,400 feet, by way of lesser peaks. At this point is Paradise Valley, where there are hotel accommodations.

Paradise Valley is embraced between two arms of Nisqually Glacier. Swift streams and tumbling waterfalls fed by the glaciers roar continuously. Beautiful wild flowers, a riot of color, border the glacier, with avalanche lilies pushing through three or four inches of snow. Dominating the scene are the white peaks of the mountain.

The Wonderland Trail, a distance of 145 miles, encircles the mountain and can be covered in a leisurely trip of twelve days. Of the twenty-eight glaciers covering Mount Rainier, two, the Nisqually and the Cowlitz, are most often explored.

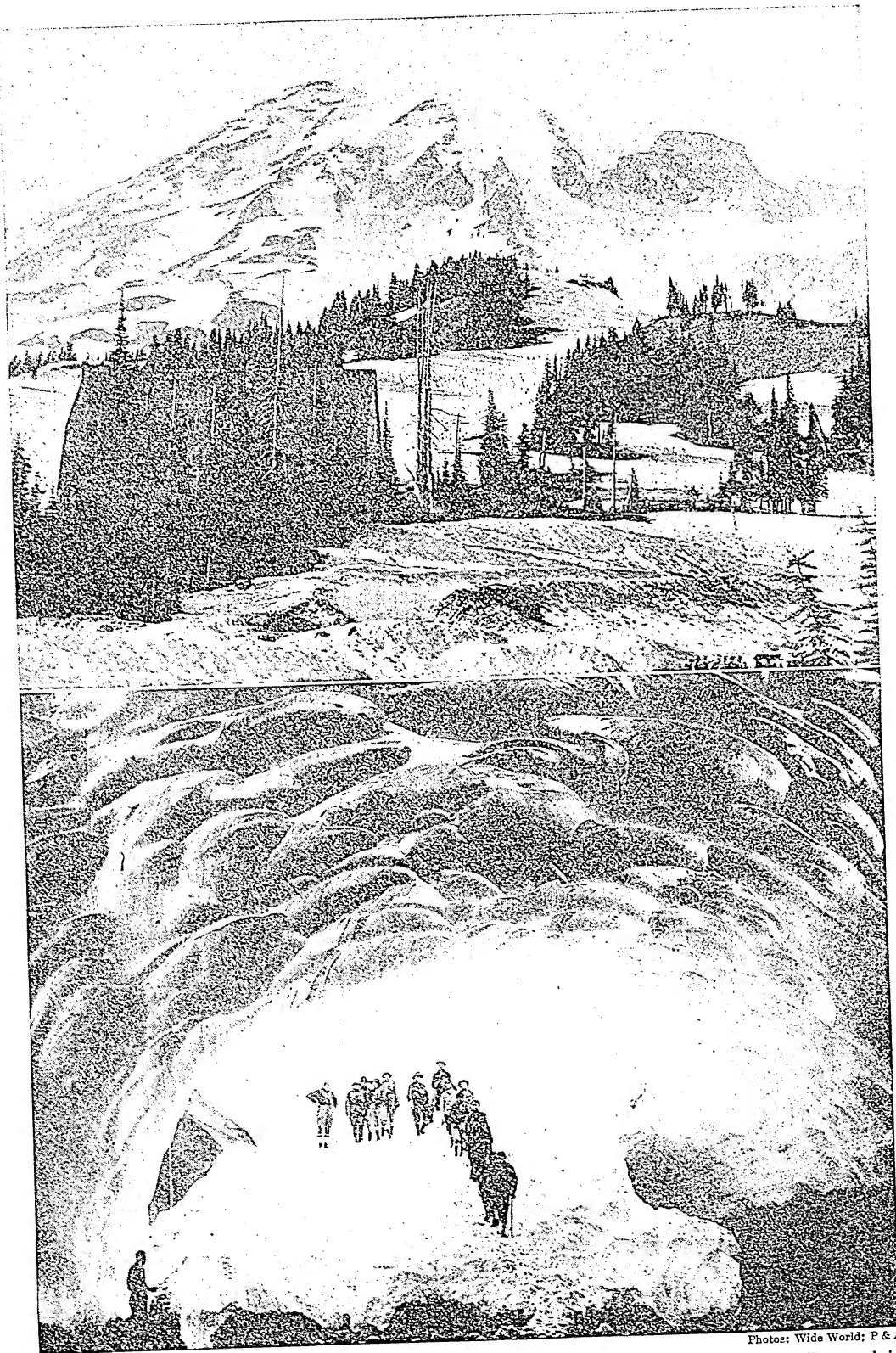
With experienced guides, climbing is not dangerous, although the climb to the summit takes almost two days and is a real test of endurance. Deep crevasses, ice caves, and steep precipices make even the lesser climbs thrilling and spectacular. The north slopes, though now little known, possess endless possibilities for development as a natural playground, and have easy grades to Columbia Crest. See illustrations, pages 5988, 7628, 7629.

RAINY LAKE, a picturesque lake lying on the boundary between Ontario and Minnesota. Its southern end is about 125 miles north of Duluth, Minn., and about 150 miles west of the shore of Lake Superior. The lake is shaped roughly like a capital L, each arm being approximately forty miles long and from three to eight miles wide. Its surface, though covering an area of more than 300 square miles, is so broken by hundreds of islands that the largest stretch of open water is hardly more than a mile wide. The shores are rocky and are lined with spruce, pine, and other cone-bearers, which are being cut to supply the mills of Fort Frances, International Falls, and other towns on the lake. The Canadian National Railway crosses the lake almost at its center. Fish are plentiful, especially pike and pickerel, but whitefish is the only kind of commercial importance. The Rainy Lake region is noted not only for fishing, but also for bears, moose,



RAIN GAUGE

Explanation appears in the text.



Photos: Wide World; P & A

Snow-Crowned Mount Rainier. The photograph at the top was taken in April; Rainier is the tallest peak in the United States that is capped with perpetual snow. Below is a beautiful cavern, carved from ice beneath a glacier field by the action of wind and water. (See page 5987.)

and other wild game. The surplus waters of the lake are carried by the Rainy River westward to the Lake of the Woods. See MINNESOTA (Location; Waters).

RAINY RIVER. See ONTARIO (Physical Features); RAINY LAKE (above).

RAISA, *rah e' zah*, ROSA (1893-), one of the foremost dramatic sopranos of her generation. She was born in Russian Poland, and attained her high artistic rank through years of great suffering. Narrowly escaping death in a pogrom, she fled from Russia at the age of fourteen, and made her way to Italy, which she had been told was the land of song. She reached Capri almost destitute. Here she was befriended by Madame Ester Ascarelli, who took her into her home and later provided for her musical education. Raissa studied at the Conservatory of Naples under Madame Barbara Marchisio. She made her debut at the Royal Opera in Parma, opening the season at the Verdi Centenary in the opera *Oberto, Conte di San Bonifacio*, the first opera Verdi wrote. She sang under the direction of Cleofonte Campanini, who brought her to America.



ROSA RAISA

Raissa made her American debut in Chicago in *Aida*, in 1913. From then until 1932 she was associated with Chicago opera, with the exception of a year passed in European opera houses and many visits to South America and Mexico City between opera seasons.

Outstanding events of her career were the creation of the title rôles in *Nerone*, by Boito, and *Turandot*, by Puccini, at La Scala, Milan's great opera house. Raissa was chosen for the part in *Turandot* by its composer, shortly before his death. Her repertory is extensive. Her interpretations of leading soprano rôles in *Aida*, *The Jewels of the Madonna*, *The Jewess*, *Tosca*, *Norma*, *Francesca da Rimini*, *Les Huguenots*, and many others won her wide acclaim. She is the wife of Giacomo Rimini (which see), until 1932 with the Chicago Civic Opera Company.

RAISIN RIVER, a stream in southeastern Michigan, which empties into Lake Erie.

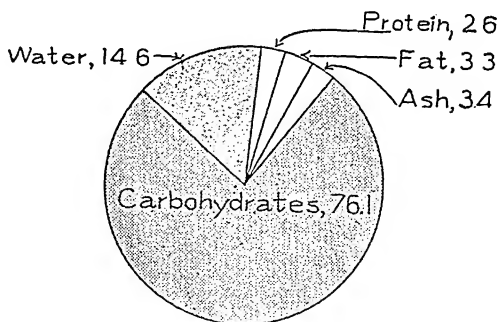
RAISIN RIVER MASSACRE. See HARRISON, WILLIAM HENRY; WAR OF 1812.

RAISINS. For hundreds of years, these delicious dried grapes have been a table luxury, and their culture has always been an important industry in the countries around the Mediterranean Sea. The finest table and cluster

raisins formerly came from Spain, and the small seedless, yellow raisins from the vicinity of Smyrna, in Turkey. In the Middle Ages, large quantities of raisins were imported from Spain into England, where they were regarded as a great delicacy. California now furnishes raisins of as fine quality as any other section of the world, and it produces enough to supply the entire country and Canada. Spain can send no finer cluster raisins than the Malagas and Muscatels of California, and Smyrna can produce no sweeter Sultanias.

California raisins began to be important in 1874. In that year, 9,000 boxes, or about 180,000 pounds, were produced. By 1894 the crop amounted to more than 100,000,000 pounds. The supply was so much greater than the demand that the market "broke," and raisins sold for less than two cents a pound. Immediately, the fruit-growers cut down their output, for they could not afford to produce more raisins than people would buy at a reasonable price. The supply has been controlled ever since by a Raisin Growers' Association, which manages very successfully to stimulate the market and to distribute the crop. The annual production now is about 250,000 tons.

How Raisins Are Prepared. The best raisins are made from grapes containing a large amount of sugar, and they are nearly always sun-dried. Occasionally, late-maturing varieties, which might be damaged by rain, are evaporated by artificial heat. Sometimes the bunches of



COMPOSITION OF RAISINS

grapes are simply cut partly through at the stem, to stop the supply of sap, and then are left hanging on the vines to dry. Usually, however, they are picked and spread out in shallow trays in the hot sun. It is customary to turn them from time to time by simply placing an empty tray top side down on a full one, and then turning both over and taking off the top tray. From ten to thirty days are required, depending on the weather and the condition of the grapes, before the raisins are considered "cured." After they are dried, they are stored in great bins called "sweat boxes,"



and left there until they can be sorted, weighed, packed, and shipped.

Almost every operation is now performed by machinery. The first machine was one for seeding raisins; the latest is one which fills, weighs, and seals the packages of dried fruit. The finest raisins are dried in clusters, just as they come off the vine, and carefully packed for table use. Loose raisins are packed in large boxes, or are seeded and put up in sealed paper cartons.

Raisins are wholesome and nutritious, and are served in numerous ways. Nuts and uncooked raisins are a pleasing form of dessert, and raisins are also extensively used in the preparation of boiled rice, puddings, bread, cookies, and other forms of pastry. See GRAPE. B.M.D.

RAJAH, *rah' jah*, a Hindu title derived from a Sanskrit word meaning *king*. It was originally given to princes who ruled over the native states of India, but has been also conferred on Hindu subjects of high rank by the British government. Each native prince, or *rajah*, has his own small army, but a British officer, called a *resident*, who lives near the court, watches the administration of the government, and gives



Photo at top: Visual Education Service

GRAPES AND RAISINS

The photograph reproduced above shows a field scene where raisin grapes are being dried.

reports to the Viceroy of India. As a rule, the native princes now also assume the title *maharajah*, meaning *great king*.

RAJPUTANA, *rahj-poo tah' nah*, a political division in the north-central part of India, known officially as **RAJPUTANA AGENCY**. It embraces twenty-one native states and one chiefship, which surround the British province of Ajmer-Merwara. The area is 131,175 square miles; the population, 11,

512,914 (1931). Most of the inhabitants are Hindus, but there are nearly one million Moham-medans. The Europeans number about 1,200.

Rajputana is separated into two distinct physical divisions by the Aravalle Hills, containing Mount Abu, over a mile in height. Much of the country is rocky or desert land, but there are fertile sections fed by many rivers in the southeastern part, and there the people grow millet, wheat, barley, sesame, corn, rice, cotton, hemp, tobacco, and indigo. The raising of camels, cattle, and sheep is the chief industry in the northwestern section, where soil and climate are unfavorable to agricultural pursuits. See INDIA.

RAKUTO RIVER. See CHOSEN.

RALEIGH, N. C., state capital and county seat of Wake County, located eighty-five miles southeast of Greensboro, was founded in 1792. It is the commercial center of a rich farming district producing corn, cotton, tobacco, small grain, and truck crops. Industries include textile and cotton oil mills, structural iron and chemical plants, and railway shops. It is the home of five insurance companies. Raleigh's schools include the North Carolina State College of Agriculture and Engineering; Meredith College (women); Saint Augustine's College and Shaw University (Negroes); and state schools for the white blind and the colored deaf and dumb. Population, 46,897 (1940).

RALEIGH, OR **RALEGH**, **SIR WALTER** (about 1552-1618), navigator and historian,

a gallant courtier. When a young boy, Raleigh attended Oxford University, but left before receiving a degree, in order to join a band of gentlemen volunteers on their way to France to help the Huguenots (see HUGUENOTS). When he returned to England, he found his half-brother, Sir Humphrey Gilbert, about to embark on a voyage of discovery and privateering to America. He joined the party, which was forced to return without

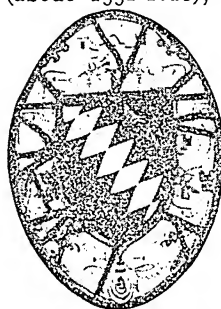


Photo: O R O C

THE RALEIGH COAT OF ARMS

It is set as a panel in a window in the room in which he was born, in Devonshire, England.

achieving success. Raleigh then became a captain in the army in Ireland. At one time, the young man was sent to the English court with dispatches, and afterward he became a great favorite with Queen Elizabeth, who knighted him in 1584. He became wealthy through grants of lands and certain monopolies given him by the queen. Upon one visit to Ireland, Raleigh discovered the genius of Edmund Spenser, whom he took to England.

Raleigh was intensely interested in discovery, and although the queen would not permit him to leave England, he obtained privileges and sent several expeditions between 1584 and 1589, which were not immediately successful. The place where the adventurers attempted to settle—Virginia—was named in honor of the Virgin Queen. Potato and tobacco plants were introduced into England from the new Virginia.

Spain was England's greatest enemy in those days. Raleigh had some part in the victory over the Spanish Armada in 1588, and afterward was at sea with two expeditions against Spain. At this time he incurred the queen's displeasure because of his love for one of her

maids of honor, Elizabeth Throgmorton, whom he was permitted to marry; but thereafter he was denied the privilege of appearing at the royal court. So Raleigh was free to explore, and soon he sailed for America. It is said that, on the island of Trinidad, he found a lake of bubbling pitch, now world-famed as asphalt, with which he filled the leaking seams of his vessels. He explored the Orinoco River for more than 400 miles.



Sir Walter Raleigh

SIR WALTER RALEIGH

The plate is reproduced from an old painting.

Before the queen's death, Raleigh was partly restored to favor, but James I distrusted him, and had him imprisoned in the Tower of London for thirteen years, where he lived comfortably with his family and servants. It was during this imprisonment that he applied himself to chemical experiments and literature. He completed one volume of a *History of the World*, intended to be the most comprehensive ever written. Raleigh was finally released from the Tower to lead another expedition to South America for gold. His party, unfortunately, attacked the Spanish, and upon his return to England, he was beheaded upon the demand of Spain.

[In these volumes, see the article DARE, VIRGINIA.]

RALLENTANDO, *rahl len tahn' doh*. See **MUSIC** (A Course of Lessons).

RALPH CONNOR, pen name of Charles William Gordon (which see).

RAM, **HYDRAULIC**. See **HYDRAULIC RAM**.

RAMA. See **VISHNU**.

RAMADAN, *ram' ah dahn*, ninth month of

but they are often cheaply sensational and over-sentimental. Ouida was at her best in writing of Italian peasant life and in descriptions of dogs, of which she was very fond. One of her children's stories, *The Nürnberg Stove*, has genuine literary merit. Her books include *Under Two Flags*, *A Dog of Flanders*, *Two Little Wooden Shoes*, and *Bimbi*. Though Ouida's writings brought her a fortune, she died in comparative poverty.

RAMESES II, *ram' e seez* (reigned 1340-1273 B.C.), one of the most famous of the Pharaohs, and the greatest of twelve rulers called Rameses. Formerly, he was supposed to be the Pharaoh who oppressed the Children of Israel, but this is now considered improbable. He ascended the throne of Egypt when very young, and reigned sixty-seven years. During the earlier part of his reign, he conquered Phoenicia and sought to overcome the Hittites. At the age of twenty-one, he formed an offensive and defensive alliance with the Hittites, marrying the daughter of their king as an evidence of good faith. The latter part of his reign was peaceful. The mummy of the king was discovered in 1881 near Thebes (see page 2150), and later it was removed to the museum at Cairo. See **PHARAOH**; **EGYPT** (History).

RAMIE, *ram' e*. See **BOEHMERIA**.

RAMONA. See **JACKSON**, **HELEN HUNT**, illustration.

RAMOTH-GILEAD, *ra' moth gil' e ad*, one of the Cities of Refuge (which see).

RAMPART. See **CASTLE**.

RAMPART RANGE. See **PIKE'S PEAK**.

RAMSAY, **SIR WILLIAM**, scientist who isolated the chemical element helium (which see). See also **NOBEL PRIZES**.

RANCHING, or the rearing of livestock upon native pasturage, is one of the oldest of all vocations. It has existed in the Old World as far back as we have any historical records and is still an important occupation in Africa, Asia, and even parts of Europe. Both North and South America, as well as Australia, also have large areas given over chiefly to ranching, but the industry did not exist among the aboriginal inhabitants, since they had no domestic animals except the dog, and in parts of South America the llama.

The early Spanish settlers brought domestic animals to America, and the plains of Argentina are now one of the greatest meat- and wool-producing regions of the world. The Spanish also brought cattle, sheep, and horses to Mexico in the earlier part of the sixteenth century, and as Mexican settlements extended northward, ranching establishments grew up in California, New Mexico, and especially in Texas. The liberal land policy of Spain and of Mexico did much to promote ranching. This course was continued by Texas both during the days of

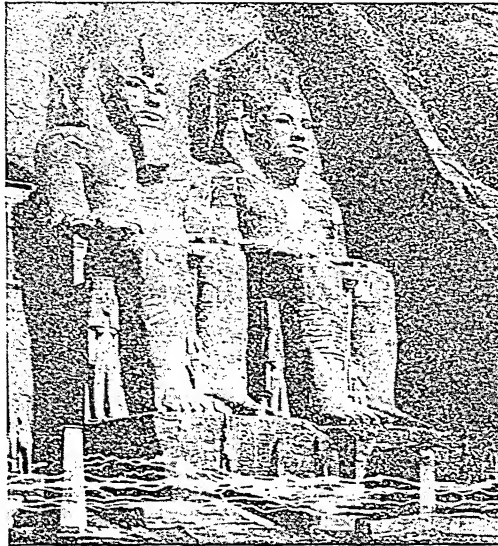


Photo: P & A

RAMESES II

Two of four original colossal figures of Rameses II in front of the rock-hewn Temple of Ammon Ra, at Abu Simbel on the Nile. This photograph, taken by moonlight, shows in wavy lines the beams from the lamps of Bedouin guides.

the Moslem year; also, the fasting indulged in at that time. See **FASTS** AND **FASTING**.

RAMAYANA, *rah mah' yah nah*, is one of the two great epic poems of India. It is the thrilling story of Rama, the king's son. He lived in a golden age, partly historical, partly legendary and mythical. Although rightful heir to his father's throne, he was banished from his home, through the intrigues of his stepmother. During fourteen years of wandering and adventure Rama is ever the hero, chivalrous and incorruptible. His wife, Sita, has been the Hindu ideal of pure devotion to duty, to husband, and to family. See **MAHABHARATA**. A.V.

RAMBOUILLET, *rah' boo yeh'*, **RAM**. See illustration, in article **AGRICULTURAL EDUCATION**.

RAMÉE, *ra ma'*, **LOUISE DE LA** (1839-1908), an English novelist, more familiarly known by her pen name, **OUIDA**. The latter had been her childish way of pronouncing "Louisa." She was born in Bury Saint Edmunds. Her first novel, *Held in Bondage*, appeared in the London *New Monthly Magazine* in 1863. Many others followed, and for a time she was widely popular. Her stories reveal a gift for picturesque description and a sense of the dramatic,

the Republic and after it was admitted to the Union as a state. As a result, when the War of Secession came, Texas was a region of great land-owners, most of whom had herds of cattle. During the four years of war the stocks of cattle in most parts of the United States were greatly reduced; but when peace came, Texas, little touched by hostile armies, was fairly overflowing with cattle.

The high price of cattle and beef in the North and East brought a great stream of cattle north from Texas in the years following the war. The herds were driven to the "cow towns," or shipping points, on the railroads extending west through Kansas and Nebraska. From here the fat, mature animals were shipped to market for slaughter while younger animals were driven farther north to stock the new ranges left open to grazing by the destruction of the buffalo herds and the placing of Indian tribes upon reservations.

Within twenty years after the close of the War of Secession the great "cow country" had reached the height of its importance, and an enthusiasm for ranching amounting almost to a craze had swept over the country and extended even to Europe. Millions of dollars of European capital, mostly from Great Britain, had been invested in ranching on the Great Plains, and much more came from the financial centers of the eastern part of the United States. A number of Europeans came over to give their personal attention to the business. Notable among these were the Marquis de Mores from France, Walter Baron von Richthofen from Germany, John Clay and Murdo MacKenzie from Scotland, and many others. Young men from the East, of whom Theodore Roosevelt furnishes a conspicuous example, also came West to engage in ranching. Great cattle companies were formed, breeds were improved, credit channels opened to the financial centers of the world, and ranching became one of America's greatest industries. At the same time came the growth of the packing industry, and the states of the Corn Belt began the extensive feeding of range cattle for market.

Not many years later, the advance of settlers westward began to crowd the ranchmen off all lands suitable for crop growing. Gradually they were forced back to the arid lands farther west or into the rough, hilly areas unsuitable for cultivation. By the close of the nineteenth century most of the great ranches had disappeared, though a few, such as the Matador, the King, and the Kennedy ranches in Texas, still flourish.

Ranching today is an important industry in the United States, though not as large as in former years. The colorful aspects of ranch life during the last quarter of the nineteenth century have, however, caught the popular fancy, resulting in the production of consider-

able literature on the subject, while the screen and the radio have done much to popularize this most romantic of all American industries.

In the Pacific Coast states the word ranch is often loosely given to a farm, as a poultry or fruit ranch. The term "dude ranch" is sometimes applied to a vacation spot in the West which provides horseback riding and an atmosphere of ranch life for its guests. E.E.D.

RANDOLPH, GEORGE W., Secretary of War in the Cabinet of the Southern Confederacy. See CONFEDERATE STATES OF AMERICA.

RANDOLPH, *ran' dolf*, JOHN, "OF ROANOKE" (1773-1833), an American statesman of the early national period, a native of Virginia, and a descendant of Pocahontas and John Rolfe.



Photo: Brown Bros.

JOHN RANDOLPH OF
ROANOKE

After completing his studies at Princeton and Columbia colleges, he began the practice of law, and in 1799 was elected to Congress. As the Democratic-Republican leader of the House, he supported Jefferson in the purchase of Louisiana, but later broke away from the Jefferson faction. Strenuous opposition to war with England cost him his seat in the House in 1813, but he regained it in 1815.

He bitterly opposed the Missouri Compromise, and styled its Northern supporters "Dough-faces."

In 1825 Randolph was elected to the Senate, where he served for two years, and in 1830 he was sent as special envoy to Russia. Randolph was opposed to slavery, and in his will freed all his slaves and provided for their support. In Congress he gained a reputation for sarcasm and invective, and his strong language regarding the appointment of Clay as Secretary of State by John Quincy Adams led to a bloodless duel between himself and Clay.

Related Subjects. The reader is referred to the following articles:

Clay, Henry Missouri Compromise Pocahontas

RANGE, an open grazing region used chiefly for cattle. See RANCHING.

RANGELEY LAKE. See MAINE (Lakes and Rivers).

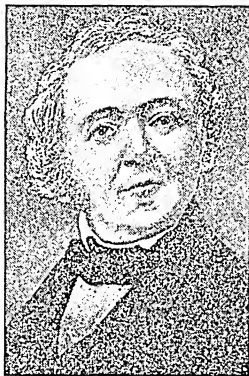
RANGERS. See TEXAS RANGERS.

RANGOON, *rang goon'*, the capital of Burma (which see).

RANJIT SINGH. See SIKHS.

RANK. See the article RANK IN ARMED SERVICES.

RANKE, *rahng' ke*, LEOPOLD VON (1795-1886), a German historian, born at Wiehe, in Thuringia. He received his education at the best of secondary schools and at the universities of Halle and Berlin. In 1818 he became an instructor of history in a school at Frankfurt-on-the-Oder. Like Niebuhr, he set as his ideal the application to history of critical methods, the discarding of prejudice and of tradition. His first book was a history of the Romance and Teutonic nations; it won for him, in 1825, a position in the University of Berlin, and two years later, he was sent at government expense to Italy, to study sources. On his way, he stopped for some months in Vienna, and there, as later in Venice, Rome, Florence, and other cities, he made researches which resulted in most valuable contributions to history. In 1837 Ranke was made full professor at Berlin, where he remained during the rest of his active career.



VON RANKE

Representative Books. Many of his works have been translated into English. Among these are *Civil Wars and Monarchy in France*; *History of England, Principally in the Seventeenth Century*; *History of the Latin and Teutonic Nations (1494-1514)*; *History of the Reformation in Germany*; and *History of the Popes during the Sixteenth and Seventeenth Centuries*.

RANKIN, JEANNETTE (1880-), an American teacher and sociologist, the first woman ever elected to the lawmaking body of an independent nation. She was chosen in 1916, on the Republican ticket, to be Congressman at large for the state of Montana in the Sixty-fifth Congress. Though Miss Rankin's victory in the election was acclaimed a triumph for the cause of woman suffrage, it was even more a tribute to her personal record. Running as an independent Republican, and in a state which contains three men for every two women, she defeated a well-known Democratic editor on the same day that the state



Photo: Brown Bros.

MISS JEANNETTE RANKIN

supported the Democratic candidate for President, elected a Democratic governor, and chose a Democrat for her colleague in Congress. She was elected a member of the House of Representatives in 1940. While in office she voted against participation by the United States in both World War I and World War II.

Miss Rankin was born on a ranch near Missoula, Mont. She was educated at the University of Montana and the School of Philanthropy in New York City.

See MONTANA (Government).

RANK IN ARMED SERVICES (United States Army, Navy, Marine Corps, Coast Guard). Rank is the measure of seniority of officers. The rank of an officer in his particular service is designated by such a title as admiral or general, and in this sense the term is synonymous with grade and enjoys its most common usage. The officers in each grade, such as all the captains in the army, also take rank among themselves in order of their times in service, dates of advancement to that grade, and other considerations. Rank or *grade* is distinguished from rate, as used in the services, in that the latter term is used in the measure of seniority of enlisted personnel only. In the United States, the president is commander in chief of the army and navy, holding title under the Constitution, but his power is usually executed through the secretary of war and the secretary of the navy.

Prior to 1916, advancement in all services to each succeeding rank was purely by seniority, dependent merely upon time in service, available vacancies, a clear record and, except for army officers, promotion examinations. In that year a system of selection to the next higher rank was adopted for the navy and marine corps, whereby a board of senior officers examines each eligible officer's record and considers primarily his proved ability and aptitude for the service. Various modifications of this method of selection are still being made in the search for the perfect system, in order to advance best-fitted officers most rapidly. The army has likewise adopted a system of classifying officers in each rank, which differs in method of application but has the same desired end in view.

Prior to 1922, officers received pay according to their rank or grade. In that year a Joint Pay Bill affecting all services was enacted which made the pay of officers below general and flag ranks dependent primarily upon time in service. This had the more equitable effect of allowing increases in pay during peacetime conditions of slow promotion, while preventing a sudden increase in payroll during wartime due to necessarily rapid promotion.

The table below shows the pay, less rental, subsistence and special allowances, for corresponding ranks in the army and marine corps,

and the navy and coast guard, the actual pay within limits shown dependent upon time in service:

ARMY AND MARINE CORPS

General Officers

General of the Armies in the United States, \$13,500.
(Army only)
General, \$8,000.
Lieutenant General, \$8,000.
Major General, \$8,000.
Brigadier General, \$6,000.

Field Officers

Colonel, \$4,000.
Lieutenant Colonel, \$3,500-\$4,000.
Majors, \$3,000-\$3,500.

Company Officers

Captain, \$2,400-\$3,000.
First Lieutenant, \$2,000-\$2,400.
Second Lieutenant, \$1,800-\$2,000.

NAVY AND COAST GUARD

Flag Officers

Admiral, \$8,000. (No rank corresponding to General of the Armies.)
Vice Admiral, \$8,000.
Rear Admiral, upper half, \$8,000; lower half, \$6,000.
Commodore, \$6,000. (This rank abolished as part of the active list in 1899; established in naval reserve in 1925.)

Senior Officers

Captain, \$4,000.
Commander, \$3,500-\$4,000.
Lieutenant Commander, \$3,000-\$3,500.

Junior Officers

Lieutenant, \$2,400-\$3,000.
Lieutenant (junior grade), \$2,000-\$2,400.
Ensign, \$1,800-\$2,000.

The only ambiguity in corresponding ranks occurs in that of *captain*; the army captain ranks with the naval lieutenant, while the naval captain ranks with the army colonel.

Related Subjects. For additional information the reader is referred to the following articles:

Admiral	Coast Guard	Navy
Army	Marine Corps	

RANUNCULUS, *ra nung' ku lus*, a group of annual or perennial herbs belonging to the buttercup, or crowfoot, family. These plants form the representative genus of the family. Of the numerous species, the best-known are the crowfoot, buttercup, and spearwort groups. The plants bear white or yellow flowers, and grow commonly in pastures and gardens or in moist places. Many of them contain poisonous juices which protect them from animals, and as a result they have spread rapidly and become weeds. See ANNUALS; PERENNIALS.

RAPALLO, *rah pah' lo*, TREATIES OF. One of the agreements among nations after World War I was signed by Italy and Yugoslavia in Rapallo, Italy, on November 12, 1920. It made provisional settlement of a long dispute over the possession of territories inhabited by Slavs and Italians, just east and north of the Adriatic Sea, which before the

war had belonged to Austria-Hungary. By the terms of the treaty, Fiume was created an independent state, Italy annexed part of Carniola and all Istria, pushed its frontier east to the confines of Fiume, and relinquished claims to Dalmatia (except the city of Zara) and the islands along the Dalmatian coast. However, Italian nationalists continued to oppose the independence of Fiume until, in January, 1924, Yugoslavia signed a treaty which gave the city and port of Fiume to Italy, leased a port in the Fiume harbor to Yugoslavia, made the Fiume station an international frontier station, and recognized Yugoslavia's sovereignty over Port Baros and Dalmatia. This arrangement seemed to satisfy both countries.

Another Treaty of Rapallo is the economic agreement which the Soviet and German governments signed in April, 1922, during the economic conference of European powers at Genoa, Italy. Rapallo is near Genoa.

Related Subjects. The reader is referred in these volumes to the following articles:

Fascism	World War I
Fiume	Yugoslavia

RAPE, an annual plant also known as *coleseed*, cultivated for its herbage, and especially for its oil-producing seeds. It has a slender, carrot-like root, is sown in drills when the seed is to be harvested, and otherwise is sown broadcast. It is cut with a sickle, and when dried, the seed is thrashed out. A cake is made of the seeds, after the oil is extracted, which is used for feeding cattle and sheep.

RAPE OF THE SABINES. See SABINES.

RAPHAEL SANTI, *rahf' a el sahn' te* (1483-1520), one of the most famous men in the history of art, called the "Divine Raphael" and the "Prince of Italian Painting." He was not only a master of painting, but a great architect and a sculptor. His *Sistine Madonna* is accounted by many the world's greatest masterpiece of painting. Just as his contemporary, Michelangelo, expressed the Renaissance ideal of energy, so Raphael's art was the embodiment of serenity, grace, and the beauty of order.

Raphael was born at Urbino, Italy. From his father, a painter of some reputation, he received his first art instruction. When about seventeen years of age, the ambitious youth was apprenticed to Perugino, a great



Photo: Brown Bros.

RAPHAEL



master of the Umbrian school, but it was not long before the pupil excelled his teacher. Among the best works of this period of Raphael's career, known as the Umbrian period, are *Marriage of the Virgin* (Milan), *Saint George and the Dragon*, and *Saint Michael* (Louvre), and several Madonnas. An admirable Madonna of this period is one of the glories of the Metropolitan Museum, in New York.

In 1504, having exhausted the teachings of the school of Perugino, Raphael fulfilled a long-cherished ambition to study at Florence, as wonderful stories had come to him of its famous artists and the great work they were accomplishing. In this city he rapidly gained a wider knowledge of his beloved art. Soon he forsook the style which had individualized his work under Perugino, for he quickly assimilated the qualities which made famous the other great men of this period. From the works of Masaccio he learned how to group his figures and how to treat draperies; his friend Fra Bartolommeo taught him many secrets of modeling and coloring, and developed his gift for the portrayal of spiritual beauty; from Leonardo da Vinci he acquired grace of expression and a knowledge of composition; while from Michelangelo he learned anatomy and dramatic action. The influence of the sculptors Donatello and Ghiberti was also important. Thus he developed what is known as his Florentine manner. Among the finest paintings of this period are the *Entombment* and many Madonnas, including the *Madonna of the Grand Duke* (Pitti Palace, Florence); *La Belle Jardinière* (Louvre); the *Madonna with the Goldfinch* (Uffizi, at Florence); and the *Madonna in the Meadow* (Vienna).

However, Raphael was destined to achieve his greatest triumphs in Rome. In 1508 Pope Julius II called him there to help decorate the Vatican, and it became a veritable museum of his works. Here, during four years, he painted the world-famous frescoes which transformed four small chambers into beautiful halls. The frescoes of the first room represent theology, philosophy, law, and poetry; those of the second the triumph of the Church over its enemies; in the third and fourth, the decorations are on historical subjects. It is significant that these paintings were executed at the same time that Michelangelo was adorning the ceiling of the Sistine Chapel with his splendid frescoes on the Creation; in these two achievements we have the supreme flowering of the High Renaissance. Raphael also designed the frescoes for the Vatican Loggias (open galleries) and a famous group of Vatican tapestries, now faded and worn. By this time he was recognized as one of the leading painters of his day. All the powerful nobles of Rome sought his fascinating society, and the commissions for paintings came so fast that he was obliged to leave the

execution of some of his frescoes to his pupils, he himself preparing the cartoons from which the designs were traced (see CARTOON).

Pope Leo X, successor to Pope Julius II, also encouraged art and learning, and under his patronage, Raphael executed the frescoes entitled *Delivery of Saint Peter from Prison* and the *Vision of Attila*, and won further distinction as the chief architect of Saint Peter's. Many of his most beautiful Madonna pictures belong to the later Roman period, including the *Madonna of the Chair* (Pitti Palace, Florence) and the greatest of all the Madonnas in the world, the *Sistine*, which occupies an entire room in the Dresden Gallery. This was painted in 1515, when the brilliant life was drawing to its close. At this time he also executed two other great masterpieces—*Christ Bearing the Cross* (Madrid) and *The Transfiguration* (Vatican). Death prevented Raphael from finishing this latter painting, and at the head of his funeral procession, from his studio to the tomb in the Pantheon, this painting was borne, its colors still wet.

Though he died at the age of thirty-seven, Raphael had made his fame secure for all time. Hardly another one of the famous Italian masters equaled him in versatility, for he excelled in whatever form of painting he attempted. His pictures are not only without a flaw in arrangement and spacing, but they have a harmony, grace, and spiritual quality that set them apart from all others. His work is the glory of Italian Renaissance painting.

Related Subjects. The reader is referred in these volumes to the following articles:

Louvre	Pitti Palace
Madonna and Her Babe	Renaissance
Painting	Vatican

RAPIDS. See WATERFALL.

RAPPAHANNOCK, *rap a han' ok*, RIVER, a waterway of Virginia which rises in the Blue Ridge Mountains and flows southeast for 250 miles into Chesapeake Bay. One of the principal cities on its banks is Fredericksburg, at the head of navigation in an earlier day. A fall at this point gives that city excellent water power for factory operation. Below Fredericksburg, for a distance of nearly 100 miles, the river is a tidal stream. The Rappahannock enters the bay through a great estuary. An important tributary is the Rappahan.

RARE COINS. See NUMISMATICS.

RARITAN RIVER, a waterway of New Jersey, formed by two branches which rise in the northern highlands of the state. It flows southeast for seventy-five miles into Raritan Bay, an inlet of Lower New York Bay. The river is navigable only as far as the fall line, near the city of New Brunswick. Perth Amboy, an important manufacturing center, lies at the mouth of the Raritan. The

stream furnishes water power for the mills of the town of Raritan, also on its banks. See FALL LINE; NEW JERSEY (Rivers and Lakes).

RASMUSSEN, KNUD JOHAN VICTOR (1879-1933), a Danish Arctic explorer and authority on Eskimo peoples. He was born at Jakobs-havn, Greenland, where his father was a missionary, and educated at the University of Copenhagen. His maternal ancestors were natives of Greenland.



Photo: Wide World

KNUD RASMUSSEN

Rasmussen's expeditions to Greenland, during the period from 1902 to 1924, enabled him to cover most of the country, and to make important ethnological studies of all Eskimo tribes of that region. He ascertained that they were all Red Indian tribes who had wandered east and west from the coast. On one Polar expedition, he discovered a large area of ice-free land, with abundant wild life.

Rasmussen's intimate knowledge of the language and customs of the natives enabled him to learn their folklore, and to make valuable contributions to the ethnological material available on these tribes. He wrote for the Eskimos in their own Greenlandic language.

His Published Works. The books which have been translated into English from the Danish originals include *Greenland by the Polar Sea*, *Eskimo Folk Tales*, *The People of the Polar North*, and *In the Home of the Polar Eskimos*.

RASPBERRY, *raz' behr ie*, a thorny bush that bears delicately flavored berries. It is a native of the northern hemisphere, and belongs to the rose family, along with the apple, peach, blackberry, strawberry, and many other fruits (see ROSE). Raspberries are the most popular of all bush fruits, and are second only to the strawberry among the small fruits. The fruit is a little cap, a collection of large cells, each with a tiny seed at the center. When ripe, the cap separates from the standard about which it grows, and it is this peculiarity that distinguishes the raspberry from the blackberry (which see).

Numerous varieties have been developed by fruit-growers; those grown in the United States are derived from the *European red raspberry* (*Rubus idaeus*), the *American red raspberry* (*R. strigosus*), the *American black raspberry*

(*R. occidentalis*), and *R. neglectus*. The last-named forms (*R. neglectus*), called purple-cane varieties, are crosses between the native red and black raspberries. The European red raspberry is not very adaptable to the climate



THE RASPBERRY

of North America, but its varieties are grown to some extent in the Pacific-coast regions, and it is a popular home-garden berry.

The red raspberry is propagated mainly by transplanting suckers that rise from the roots; the black and purple are grown from tip layers. The tips of the stalks, when bent over and covered with soil, send out roots, and the rooted tips are transplanted the following season. Raspberries make their best growth in fine, deep, sandy loam, and in regions of cool summers. They require pruning and winter protection in severe weather.

Red raspberries ripen first, but give the smallest yields. The black varieties ripen next, and the purple last. The latter are the heaviest bearers. The fruits are picked when ripe, but while the flesh is still firm. All varieties are excellent for canning, pies, and jam, and are delightful, too, when eaten fresh with sugar and cream. B.M.D.

RASPUTIN, GREGORY (1871-1916), a Russian monk of peasant birth, uncouth and unlettered, who exercised a baleful influence upon the royal family during the last years of the czarist régime. He possessed a magnetic personality, and gained such power over the mind of the czarina and interfered so greatly in the affairs of state that his murder was planned and carried out by some of the nobility. A.P.

RAS TAFFARI, former name of Haile Selassie I, Ethiopian emperor. See ETHIOPIA.

RASTATT, *rah' shtaht*, TREATY OF. See SUCCESSION WARS.

RAT, one of the larger rodents (gnawing animals), belonging to the same family as the mouse. The two most common species, the *black* and the *brown* rats, are found in nearly all parts of the world. The black rat is between seven and eight inches in length, exclusive of the tail, while the brown grows to be

ten or eleven inches long. The black rat is much less aggressive than the brown, and is uncommon where its more powerful cousin has established itself. The latter has shorter hair, a shorter tail, smaller ears, and a less pointed nose than its darker relative. These animals infest boats, wharves, dark and neglected buildings, barns, and dwelling houses.

Rats are undoubtedly the worst enemy of man among the mammals. They are terrible pests, being very destructive to stored grain, young poultry, fruits, vegetables, eggs, and other food products. Their sharp teeth can gnaw through wood or plaster. They have a remarkably keen sense

to become interesting pets, as they have considerable intelligence.

Rats breed several times a year, producing from six to fifteen young in a litter. This tendency to rapid multiplication, combined with the fact that rats are carriers of the deadly bubonic plague (see **PLAGUE**), makes necessary a ruthless war against them. Western United States ports, which are visited by vessels from Oriental countries, where the plague has firmest foothold, are especially active in the never-ending campaign looking to extermination.

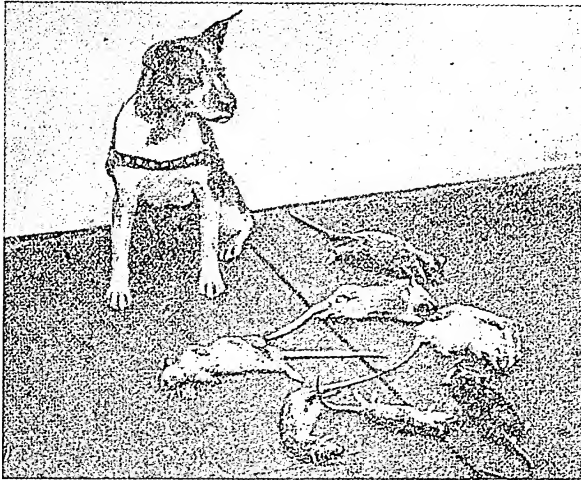


Photo: U. S. Dept. of Agriculture

A RAT ENEMY

A small terrier, if taught to hunt, will sometimes keep all farm buildings free from rats.

How to Get Rid of Rats. It is far more important to keep rats from breeding than it is to destroy them after they have become numerous. The former result can usually be ac-

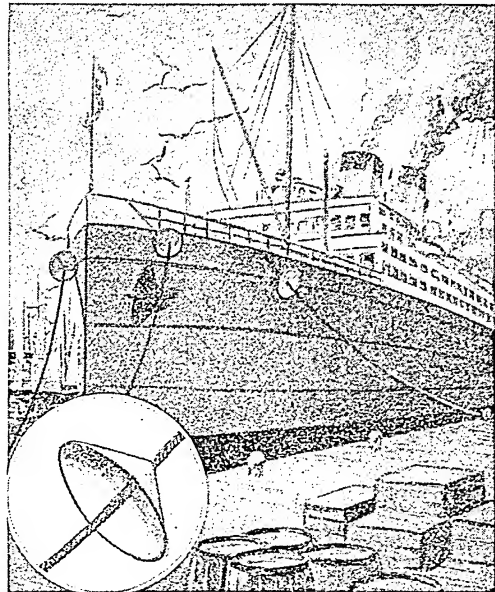


Photo: U. S. Dept. of Agriculture

THE MENACE OF AN OPEN GARBAGE CAN

This is one of the most common sources of the rats' food supply.

of smell, and readily detect the approach of danger. It is possible to tame and train them



HOW SHIPS ARE KEPT FREE FROM RATS

complished by keeping all garbage in closed metal containers and by making buildings rat-proof with wire netting and concrete, thus limiting their food supply and hiding places.

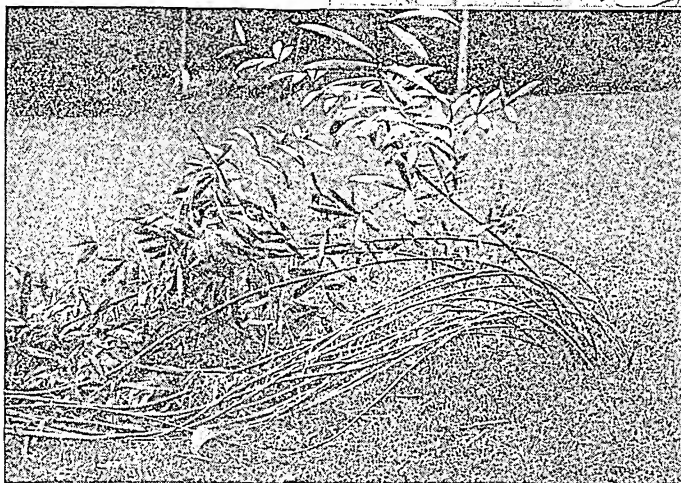
The most effective means of destroying rats is by the use of traps and poisons. The spring, or guillotine, and the cage traps are both used with success. It is best to wash the traps and handle them with gloves, as rats regard with suspicion objects smelling of human hands. Arsenic, barium chloride, and strychnine are good poisons. Extreme caution must be used in placing the poisons, in order that only the intended victims may discover them. Ships and storehouses can readily be fumigated to destroy the rat population. Whole rat families may be destroyed in their homes by saturating a cloth with carbon bisulphide, placing it in the entrance to the burrow, and sealing it in with earth,

moves the carriage of a typewriter forward is a good example. With the pressing down of each key, the carriage is moved forward the



RATTAN

Below, the growing plant. Above, a laborer is removing the bark, or skin, to uncover the cane beneath it. The cane is then washed and dried for shipment.



space of one letter. The *pawl*, which is part of the ratchet, prevents the spring that produces the tension from pulling the carriage back.

RATEL, *ra' tel*, a small animal of India and Africa, belonging to the weasel family. It is dark gray on the upper part and black below; this combination is a strange coloring in mammals, whose darker fur is usually on the upper part. The African ratel has a

so that the fumes cannot escape. Care must be taken to prevent fires and explosions, by not permitting fire of any kind near by. See **MOUSE**.

W.N.H.

Scientific Names. Rats belong to the family *Muridae*. The black rat is *Rattus rattus*; the brown, *R. norvegicus*.

RATCHET, *rach' et*, a device for preventing the backward motion of a wheel. It consists of a piece of metal hung on a pivot at one end, and having the other end so shaped that it will fit the space between the teeth of the wheel and act as a brace. A *ratchet wheel* is a toothed wheel rotated by a ratchet that is attached to a lever having a forward-and-backward or an up-and-down motion. The wheel that

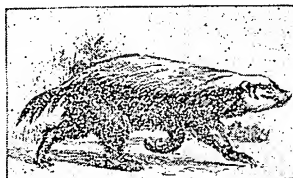
distinct white line around the body between the black and gray fur, appearing to wear a white-edged blanket. Its teeth are smaller and weaker than those of the Indian animal, but otherwise the two are almost identical. The ratel eats insects, frogs, birds, and rats. It is very fond of honey, and is sometimes called *honey badger*. See **WEASEL**. M.J.H.

Scientific Names. Ratels belong to the family *Mustelidae*. The African species is *Mellivora capensis*; the Indian, *M. indica*.

RATES OF INTEREST. See **INTEREST** (Legal Rates).

RATHBONE, JUSTUS H. See **PYTHIAS**, KNIGHTS OF.

RATIO, *ra' shih o*, the relation which one quantity has to another quantity of the same kind.



THE RATEL

The only way in which the relative size of two quantities can be compared is by division. Now a fraction is always an expression of division. Ratio is therefore expressed by a common fraction, as $\frac{2}{3}$ and $1\frac{1}{8}$. The fraction $\frac{2}{3}$ expresses the ratio of 2 to 3. The fraction $1\frac{1}{8}$ expresses the ratio of 11 to 8. These ratios, instead of being written as fractions, are also expressed as 2:3 and 11:8. The ratio of one quantity to another of the same kind may then be defined as the (abstract) number, usually a fraction, by which the second must be multiplied to produce the first. Ratio cannot exist between two quantities of different kinds. For instance, to find the ratio between 4 quarts and 6 pints, the quarts must first be reduced to pints, or the pints to quarts, as follows: 4 quarts=8 pints. The ratio of 8 pints to 6 pints= $\frac{8}{6}=\frac{4}{3}$, or 4:3. Again, 6 pints=3 quarts. The ratio of 4 quarts to 3 quarts= $\frac{4}{3}$ or 4:3. A proportion (which see) is an equality of ratios. J.W.V.

RATION, *ra'shun*, a term used in these volumes in connection with cattle-feeding. See the article **CATTLE**, page 1255.

RATIONALISM, *rash' un al i'zm*, in the broadest sense means *reason*, as opposed to *faith*. As the Christian religion spread and the power of the Church increased, a good deal of arbitrary authority came to be exercised in matters of faith. As learning increased, men revolted more and more against any authority in matters of belief. They questioned not only the authority of the Church, but also that of the Bible, and certain scholars claimed that one could believe nothing unless it could be proved. Many philosophers taught that such instinctive feelings as love, trust, confidence, courage, and fear should have no influence on belief; that only the reasoning mind could say what was to be believed. Voltaire, Lord Bacon, Descartes, and Kant are a few of the men who taught rationalism in various forms. See **SUPERNATURALISM**.

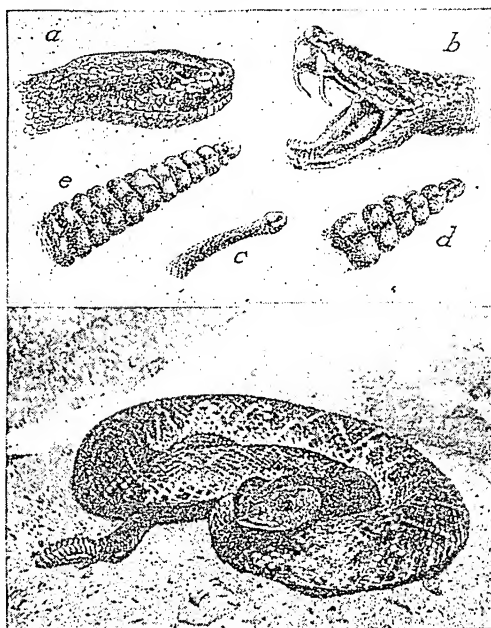
RATITAE, *ra ti' te*. See **BIRD** (Framework of the Body).

RATON, *rah' tone*, N. MEX. See **NEW MEXICO** (back of map).

RATTAN, *rat tan'*, tough, fibrous material from the reedy stems of various species of palms found in East India and Africa. The rattan palms belong to the genus *Calamus*. Their stems, which are sometimes hundreds of feet long, have the peculiar habit of climbing over other trees by means of little hooks on the leaves [see **PALM** (Habits of Growth)]. In the countries where the rattan palms grow, the natives use the stems to make ropes and mats, and they are extensively imported by American and European countries for use in the manufacture of umbrella handles, walking sticks, furniture, baskets, and chair bottoms (see **CANE**).

The natives prepare the stems for shipment by cutting them into lengths of five to twenty feet and tying the pieces into bundles. They free the stems from the leaves and outer covering by pulling them through a notch in a tree or board. Strength, flexibility, and durability are the special qualities which make rattan a valuable commercial product. The finest grades come from the island of Borneo, and other valuable rattans are produced in Burma, Ceylon, Malaysia, and Sumatra. Some pieces of rattan palms yield an edible fruit, and the young shoots are eaten like vegetables. See illustration, page 6000. B.M.D.

RATTLESNAKE, an American snake that gives full warning to an approaching enemy by vibrating the end of its tail. This move-



Lower photo: Visual Education Service

THE RATTLESNAKE

(a) Head; (b) head, showing open mouth; (c) tail of a snake one year old; (d) tail of a snake two years old; (e) the rattle of an adult in its fourth year. The lower illustration is that of a diamond-back rattlesnake, coiled to strike.

ment causes a set of hard rings to rattle noisily, and woe unto the animal or person that disregards the sound. The rattlesnake has deadly fangs, whose attack is fatal if the venom is not removed from the wound quickly. Whisky is the worst possible medicine to give a person suffering from poisonous snakebite, because it stimulates the heart and causes the poison to travel rapidly through the blood stream (see **SNAKE**, for complete directions for treating snakebites).

Originally, rattlesnakes were found over North America generally, especially in stony

and barren places, but they have been exterminated in thickly settled districts. There are also two species in South America. They are thick, heavy reptiles, but not, as a rule, over five feet in length. The system of rattles is a series of hollow rings of horny material, loosely fitted together. Each ring fits over a part of the preceding one. The first, formed at the end of the tail, is the smallest, for it originally grew over the soft body of the young snake. Each time the skin is shed, or two or three times a year, a new ring is formed, and the joints gradually increase in size as long as the snake grows. Those developed after the reptile is full grown are all

rattler presents a rather terrifying appearance. When alarmed and angered, the reptile strikes



of one size. The number of rings does not, therefore, as is generally believed, represent the number of years a snake has lived. In the British Museum there is a rattle with twenty-one joints—the largest one in the collection.

Rattlesnakes are not vicious if let alone, and they prefer to drive intruders away. With tail held erect in the circle of the coiled body, the head lifted, rattles vibrating, and hissing sounds coming from the mouth, a disturbed

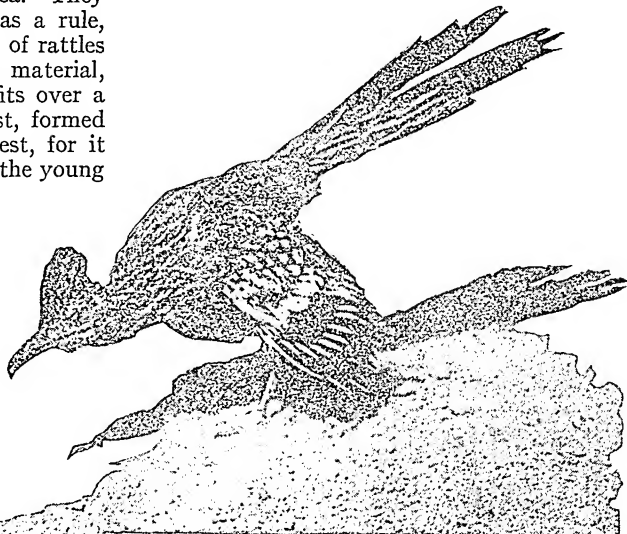


Photo: U & U

THE RATTLESNAKE AND A WORTHY FOE

This picture shows a rattlesnake and a roadrunner or chaparral cock (see page 6139), also known as a rattlesnake killer.

with lightning rapidity, thrusting out its movable fangs from a wide open mouth, and hitting hard. The poison is contained in a pair of glands, one beside each upper jaw. The king snake, bullsnake, and some other large reptiles fight and kill rattlesnakes, but their chief animal enemies are probably pigs. These tough-skinned animals eat the snakes with

impunity, their hides and layers of fat being a protection against the bite. Rattlesnakes themselves are useful destroyers of rats, mice, and other vermin. They bring forth their young alive and spend the winter in a torpid condition. L.H.

Species and Classification. Rattlesnakes belong to the subfamily *Crotalinae*, or pit vipers, of the family *Viperidae*. The most common species, *Crotalus horridus*, is found in the United States as far west as Kansas. The body varies in color from tawny to dark brown, and has numerous

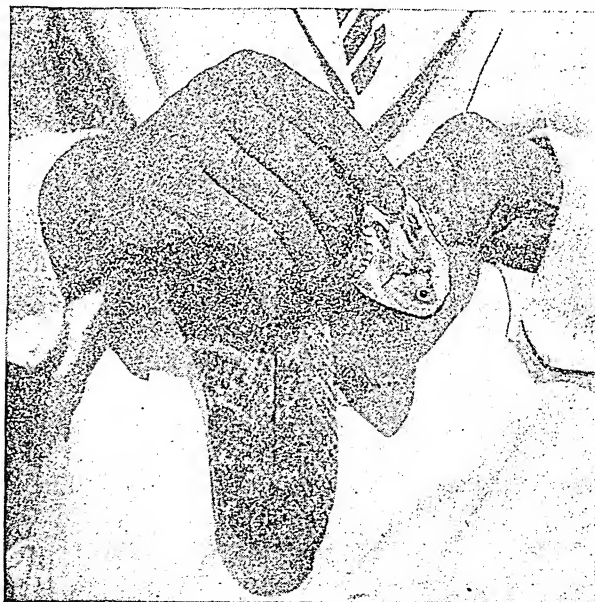


Photo: Keystone

INSIDE A RATTLESNAKE'S MOUTH

crossbars of irregular brown spots. A larger species, the diamond-back rattlesnake, *C. adamanteus*, occurs in the Southern states. Specimens eight feet long have been found on the Mangrove Islands of Western Florida. This rattlesnake is so called because its body is covered with black, diamond-shaped blotches edged with yellow. There are eleven other species of the genus *Crotalus* in North America, and three species of small prairie rattlers, placed in the genus *Sistrurus*.

RATTLEWEED. See LOCO WEED.

RAUCH, rauK, CHRISTIAN DANIEL (1777-1857), which fold against the upper jaw. a German sculptor of high rank. His great monumental works, especially his masterpiece, the magnificent bronze statue of Frederick the Great, in Berlin, are thoroughly national in spirit, and are characterized by dignity, harmony, and beauty of composition.

In his boyhood, Rauch served as a sculptor's apprentice. In 1797 he became valet to Frederick William III of Prussia, but his love for art soon asserted itself, and through the generosity of a nobleman, he was enabled to study at Rome, where he enjoyed the friendship of Thorwaldsen and Canova. His first productions of note were *Sleeping Endymion* and *Artemis* and a bust of Queen Louise. A monument to this queen in the royal mausoleum at Charlottenburg, begun by the sculptor in 1818, established his fame. The following year he founded in Berlin a royal atelier of sculpture. His bronze statues of Field Marshal Blücher and Maximilian of Bavaria, and his busts of Dürer, Goethe, and Thorwaldsen, are a few of the many fine examples of his genius. See SCULPTURE (Germany).

RAVEN, the largest of the crow family, a bird of much intelligence and cunning, known from the remotest times and connected with the history and mythology of many nations. It is the first bird named in the Bible. Noah sent a raven out from the Ark (*Genesis* VIII, 7), which flew to and fro until the waters were

dried up. Elijah, by the brook Cherith, was fed by ravens (*I Kings* XVII, 6), and in both the Old and New Testaments the bird is mentioned in illustration of God's care for His creatures. Pliny, the Latin naturalist and writer, tells the story of a raven that raised the water in a bucket to a drinking level by dropping in pebbles.

The Scandinavian peoples held the raven in veneration, and when the Danes invaded England in the ninth century, their flag bore a black raven on a red field. The Indians of Northwestern North America regard the bird as the visible representation of some mystical, unseen being, and its image is the totem of some tribes (see TOTEM). Its black color has long made the raven an omen of disaster and death to superstitious minds. Poe, in his poem *The Raven*, makes it the symbol of his weird and melancholy mood, as illustrated by the lines:

Take thy beak from out my heart and take thy form
from off my door.
Quoth the Raven, Never
more.

Ravens are widely distributed in the northern hemisphere. In North America they occur numerous in the Western United States, Northwestern Canada, and in Alaska, but are very rare east of the Mississippi River. These birds are easily recognized. Large specimens measure twenty-six inches in length and have a wing breadth of three

feet. They live as long as a man, and are said to mate for life. Their nests are built in the late winter, on cliffs or in ancient dwellings. The eggs are from three to eight in number and are of a light-greenish color, blotched with brownish spots. Ravens will eat almost any kind of food, and because they like dead animal flesh, are good scavengers.

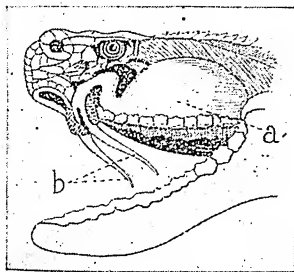
D.L.

Scientific Names. Ravens belong to the family *Corvidae*. The common American raven is *Corvus corax sinuatus*.

RAVINE DEER. See GAZELLE.

RAWLINSON, SIR HENRY. See CUNEIFORM INSCRIPTIONS.

RAY, the common name for a group of fish including six different families. The general characteristic of the group is their possession of expanded and fleshy pectoral fins, which are seemingly continuations of the body. In some cases, these form with the body a flat disc.



DISSECTED HEAD

(a) Poison sac; (b) erectile fangs, which fold against the upper jaw.

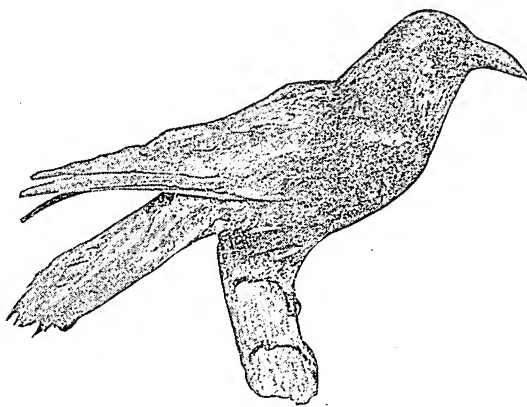


Photo: Visual Education Service

THE RAVEN

The six families are represented by the sawfish, the shark rays, the electric rays, the skates, the sting rays, and the eagle rays, or devil fish. L.H.

Related Subjects. The reader is referred to:

Electrical Fish	Sting Ray
Sawfish	Torpedo
Skate	

RAY, CAPE. See CANADA (Map: Newfoundland).

RAYNAUD'S DISEASE, a fairly rare condition in which fingers, toes, or ears become alternately deadly white and dusky red, and very painful. It is due to spasms of the smaller arteries, believed to be of nervous origin. Use of tobacco has been shown to produce similar effects in some persons. Treatment must be advised by a physician for each case. W.W.B.

RAYON, *ra' on*, a textile fabric made from modified cellulose. Formerly it was known as artificial silk, but in 1924 United States producers decided upon the coined word rayon, from the English word "ray," meaning beam or light. Count Hilaire de Chardonnet, a French chemist and a pupil of Louis Pasteur, was granted a patent on his process in 1884, and at the Paris Exposition of 1889 fabrics made from his laboratory-produced threads were exhibited. Shortly thereafter the first factory to produce the new yarn was opened in northern France.

The manufacture of rayon on a commercial scale in the United States began in 1911 with a production of 320,000 pounds, and in forty years increased more than a thousand fold.

Rayon is made from the cellulose of wood pulp or cotton linters, or from a combination of the cellulose from these two sources. The chief problems in making rayon are getting the cellulose in solution and then getting it out of solution and into a continuous yarn. Various chemical processes convert the cellulose into a liquid about as thick as castor oil. The cellulose in solution is forced through a spinnerette containing many tiny holes. The outgoing filaments combine to form rayon yarn.

There are four types of rayon, classified according to manufacture. The original *nitro-cellulose* process was first disclosed by Chardonnet. The raw material is treated with nitric and sulphuric acid, forming nitrocellulose. In the *cuprammonium* process, used extensively in Germany, the cellulose is dissolved in an ammoniacal copper oxide solution. The bulk of the world's rayon is made by the *viscose* process, wherein the pulp is treated with caustic soda, and then with carbon bisulphide, to form cellulose xanthate. A weak solution of caustic soda is added and after thorough mixing the viscose solution is formed. The first three types are regenerated cellulose rayons. A fourth type is made by the *acetate* process, wherein the pulp is treated chemically to make cellulose acetate from which the yarn is made.

Acetate rayons are not regenerated cellulose, but have certain superior qualities. They resist stains and absorb little moisture. White acetates are not yellowed by age or exposure to light.

Rayon as originally made was highly lustrous, but by later processes it is possible to obtain any desired degree of luster. The dry and wet strengths of rayon have been greatly increased, and the quality is uniform. All types of color effects are obtainable and fabric types are extremely diversified, ranging from transparent velvets to rough crepes, matelasses, sheers, and plain weaves.

A later development in the industry was that of spun rayon, made usually from viscose process rayon. This material is useful in the novelty wool class, where the rayon and wool fibers are blended. Spun rayon is also made into tropical suiting material for men's wear.

Rayon is the second textile fabric, coming after cotton and before wool. It is used alone and blended with natural fibers.

The knitting industry was first to adopt rayon in a large way, and knit goods have steadily increased in volume. The production of woven rayon has grown enormously. The almost countless uses of rayon include underwear, pajamas, lingerie, dresses, piece goods, blankets, linings, braids, laces, scarfs, sweaters, draperies, and upholsteries.

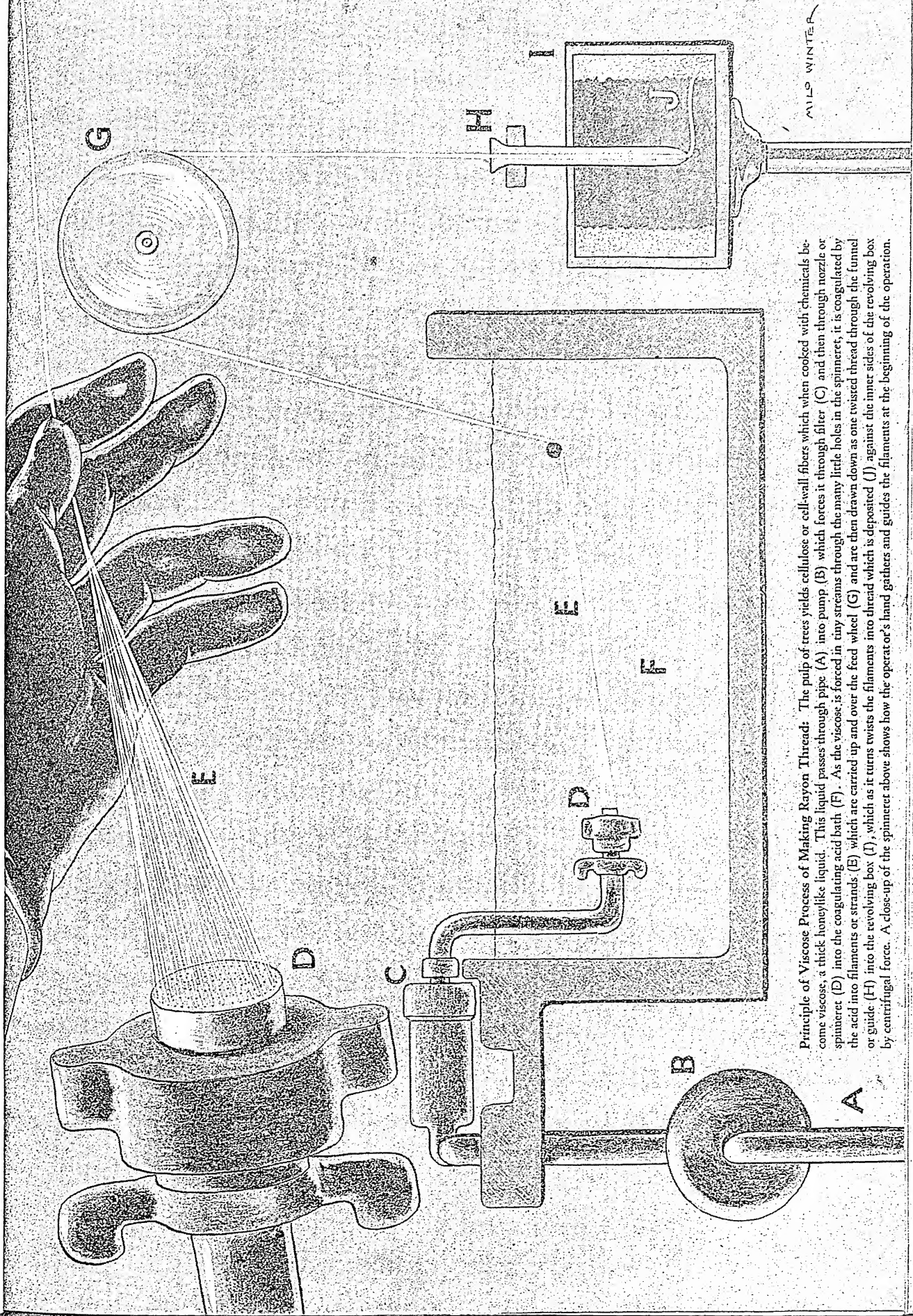
World production is around 2,230,000,000 pounds annually. Leadership in this output has been held by various countries, but the chief producers under peacetime conditions are usually Germany, Japan, United States, Italy, Great Britain, France, The Netherlands, Russia, Belgium, Canada. See pages 6004a-b.

Related Subjects. The reader is referred to: SILK; ADULTERATION OF FOODSTUFFS AND CLOTHING; CHEMISTRY (Contributions of Chemistry to Human Welfare); CELLULOSE.

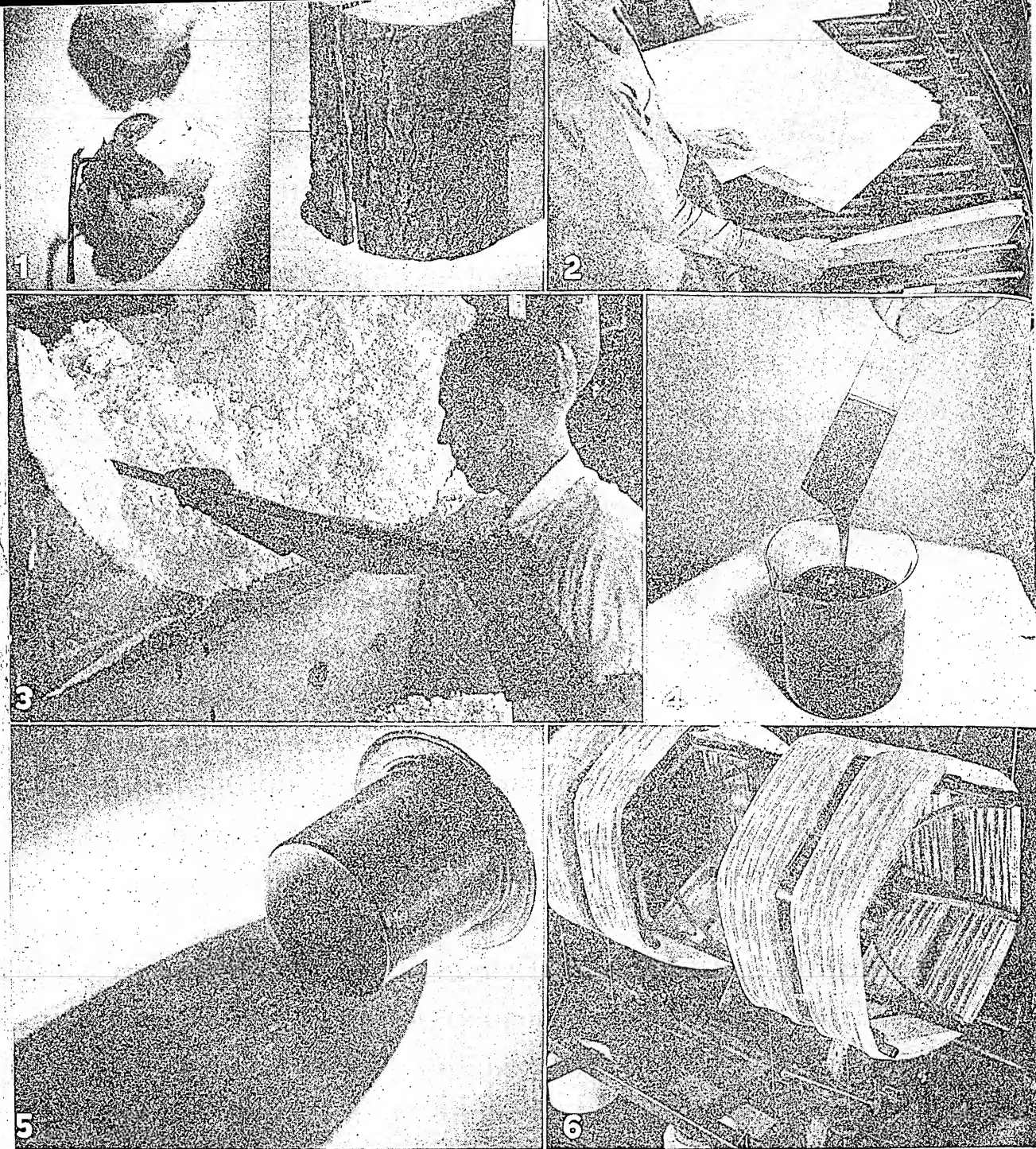
RAZOR, *ra' z'r*, a cutting instrument used to remove hair from the skin. The standard type of modern razor has a blade from three to four inches in length, made of specially tempered steel, with a rounded back, sloping to a very fine edge. The blade is generally bound by a rivet to two pieces of metal, ivory, or bone, between which the blade rests when not in use, closing like a springless knife. Manufacturers of Sheffield, England, formerly made the best blades, but the product of many German factories now equals the best Sheffield razors.

A good razor will last indefinitely if taken care of. It is customary to smooth the cutting edge with a leather strop before the razor is used. The blade needs to be honed or sharpened once in a while, and machines which do this work are on the market.

There is an increasing demand for what are known as "safety razors." These have short,



Principle of Viscose Process of Making Rayon Thread: The pulp of trees yields cellulose or cell-wall fibers which when cooked with chemicals become viscose, a thick honeylike liquid. This liquid passes through pipe (A) into pump (B) which forces it through filter (C) and then through nozzle or spinneret (D) into the coagulating acid bath (F). As the viscose is forced in tiny streams through the many little holes in the spinneret, it is coagulated by the acid into filaments or strands (E) which are carried up and over the feed wheel (G) and are then drawn down as one twisted thread through the funnel or guide (H) into the revolving box (I), which as it turns twists the filaments into thread which is deposited (J) against the inner sides of the revolving box by centrifugal force. A close-up of the spinneret above shows how the operator's hand gathers and guides the filaments at the beginning of the operation.



Photos: 1, 4, 6, American Viscose Corporation; 2, 3, du Pont Company

Manufacture of Rayon. (1) Cotton and spruce wood. Cellulose is obtained from pulp made from cotton linters or spruce chips. (2) Pure cellulose sheets being immersed in a solution of caustic soda. After a stipulated time, they are pressed to remove excess liquor, then fed into a machine that shreds them into a fluffy pulp known as alkali cellulose. (3) Unloading alkali cellulose from a shredding machine. This is mixed with carbon disulphide to make cellulose xanthate, which when dissolved, becomes (4) viscose, resembling honey. (5) Spinneret through which viscose is forced and made into fine filaments. (6) Skeins reeled prior to washing and bleaching. (See also diagram on preceding page.)

rectangular blades mounted at such an angle in holders that it is almost impossible to cut one's face during the operation of shaving. In recent years the electric razor has become popular. It is a compact clipper actuated by a small electric motor.

Razors were used by the men in ancient Egypt, for they preferred clean-shaven to bearded faces. Julius Caesar wore neither beard nor mustache. In the English army regulations, there still stands a curious order to the effect that no soldier shall shave his upper lip; if a man in the English navy wishes to use a razor, he must shave both beard and mustache. These olden-time orders, however, are not strictly obeyed. The United States army and navy regulations permit the use of the razor as one prefers.

RE, *ray*, or RA, the god of the sun in Egyptian mythology. After Re had brought order out of the original chaos, which was the world, he reigned in peace until, in his old age, the gods became unruly, and Isis led a rebellion against him. In this rebellion, even mankind joined, and all must have perished had not Re himself called back the goddess Hathor, whom he had sent to destroy them. But the weight of his years told on his spirit, and finally he willingly resigned his rule and retired to the heavens, where he rests on the back of the celestial cow. In Egyptian art, Re is a hawk-headed man, holding the royal scepter in one hand, the symbol of life in the other. His head is crowned with a disc and serpent.

REACTANCE. See RADIO COMMUNICATION (Glossary of Radio Terms).

REACTIONS, CHEMICAL. In chemistry, certain substances may be brought into contact with one another without any chemical change; each substance remains exactly what it was before. There are others, however, which affect each other strongly. The chemical change which results is known as a *reaction*. The beginner often finds the reactions very puzzling; two substances may be transformed into something that possesses not the least resemblance to either of the original agents, and yet nothing has been added or subtracted. Thus, if hydrochloric acid is poured on caustic potash, water and chloride of potassium are formed. To the chemist, however, the process is perfectly simple. Hydrochloric acid is HCl and caustic potash is KOH [see CHEMISTRY (Chemical Symbols)], and the combination may be expressed as $\text{KOH} + \text{HCl}$; while water is H_2O and chloride of potassium is KCl, and the combination may be written $\text{H}_2\text{O} + \text{KCl}$. The reaction may thus be expressed as $\text{KOH} + \text{HCl} = \text{H}_2\text{O} + \text{KCl}$. It is evident, now, that on each side of the equation there are two atoms of hydrogen (H), one atom of oxygen (O), one atom of potassium (K), and one atom of chlorine (Cl).

The subject of reactions plays a very large part in the study of chemistry. The doctrine of chemical affinities, the atomic theory, and the question of chemical compounds are all bound up with it. The reader is referred, therefore, to the article CHEMISTRY, and to the references listed at the end of that article. T.B.J.

READ, *reed*, OPIE [PERCIVAL] (1852-1939), an American novelist and humorist, born at Nashville, Tenn. After a very brief school course, he became a newspaper reporter at Franklin, Ky., worked on various Arkansas and Ohio papers until 1883, and in that year established a humorous journal which became famous as *The Arkansaw Traveler*. After 1891, Read engaged in literary work in Chicago, making that city his home. Such fiction as *A Kentucky Colonel*, *A Tennessee Judge*, *Old Ebenezer*, and *A Yankee from the West* gained a wide reading, because of the charm of local color, the unique characters portrayed, and the appeal to the emotions. The author achieved a degree of success on the lecture platform. In 1926 he published a novel entitled *Come on Buck*.



Photo: Brown Bros.

OPIE READ

READ, THOMAS BUCHANAN (1822-1872), an American poet and painter, best known for his stirring ballad of the War of Secession—*Sheridan's Ride* (see SHERIDAN, PHILIP HENRY). He was born in Chester County, Pa., and spent his early youth on his father's farm. The *Boston Courier* published his first verses in 1843. In 1852 Read went to Rome to study painting, for he was chiefly interested in art.

By These He Is Remembered. *The Lost Pleiad*, *The Water Sprite*, and *Sheridan and His Horse* are among his best-known paintings. His writings include *Lays and Ballads*, *The New Pastoral*, and *The House by the Sea*. *Female Poets of America*, compiled by him in 1848, contained illustrations reproduced from portraits he himself had painted.

READE, *reed*, CHARLES (1814-1884), an English dramatist and author of many novels. After receiving a degree from Magdalen College, Oxford, in 1835, he became dean of arts, and later vice-president, of that college. In 1843 he was called to the bar, and from that time lived in London. His first play, which appeared in 1852, was made into the novel *Peg Woffington*. He had a vivid imagination, and enjoyed great popularity.

His best-known and most interesting novel is *The Cloister and the Hearth*, the story of the adventures of the father of Erasmus.

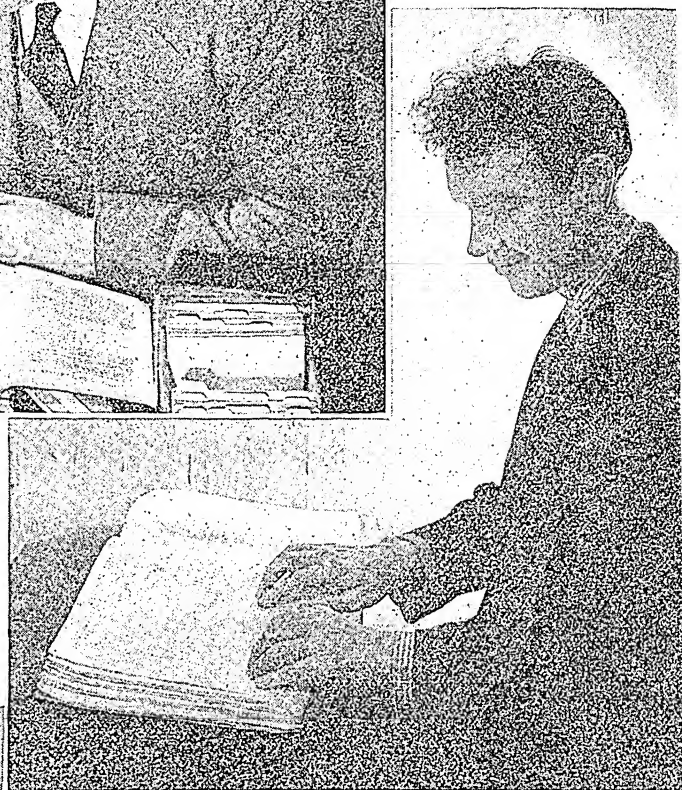
READING



READING FOR PLEASURE AND PROFIT

Above: In modern life, many jobs require a wide knowledge of various subjects. These two men are reading technical books to enable them to keep abreast of new business developments. *Right:* Braille, with its alphabet of raised characters, makes the world less dark for thousands of blind people. *Below:* Most clubs have reading rooms where members can escape from the workaday world through reading books, magazines, newspapers, and other publications.

Photos: American Library Association; New York Public Library; Eugene Smith-Black Star



READING is an experience which affects the reader in various ways, depending upon what he reads, how and why he reads, and what personal experience he brings to the reading.

A child who is learning to read thinks only of the act of reading. To him, reading means making sense out of written words, instead of spoken ones. Any teacher knows that among twenty students who can read, there are twenty different ways of reading. *How* a person reads has much to do with the results. The words may be read carelessly, or the reader may give them such close attention that he analyzes their meanings and is able to separate the correct ones from the false. Hence the method of reading is one of its important aspects.

The scholar thinks of reading as an aid to finding and developing ideas which he has never had before. He reads what other scholars in his field have written, then combines their ideas with his own. Thus the scholar is interested primarily in the content of reading. He has long ago learned how to read, but he is now concerned with *what* he reads, with the difference between his own ideas and those expressed in print. The same is true to some extent of all serious readers.

To make people buy his goods, the man with something to sell usually advertises. If he is selling diamond necklaces, which few can afford, then his concern with reading is to know "who reads what," and how to reach the right readers. If he can find a newspaper or magazine that is read by a large number of persons who are likely to want and can afford diamond necklaces, he will be wise to advertise in it. But suppose he also sells mousetraps. Those who need mousetraps are seldom in the market for diamond necklaces, and vice versa. So he also needs to know which publications the mousetrap buyers are likely to read. See ADVERTISING.

Many look upon reading as a means of propaganda (which see), or as a way of persuading others to act in a given manner or to believe in a certain way. To achieve their goal, they must first make sure that what is written and published will be read by those whom they want to persuade. For such reasons, reading should also be defined in terms of the kinds of persons who read. During presidential campaigns in the United States, nearly all the newspapers of the country have supported at one time or another a candidate who was defeated in spite of their support. Many examples can also be given to show that public officials, scientists, historians, and other writers who have tried to influence readers in a given direction have moved them in the opposite direction—or have not moved them at all. To know what reading is, one must, therefore, know how and under what conditions a reader is swayed, influenced, or changed by what he reads.

Why People Read

There is a close connection between the reasons for reading and its effect upon the emotions, knowledge, and behavior of the reader. Indeed, there are some effects of which the reader may not even be conscious.

Sharing Experiences. Most people read for the same reason that they talk. They want to express themselves by sharing their experiences with others. Denying a person all opportunity to communicate with others might soon drive him insane. Human beings find self-expression necessary to their mental and physical health and happiness. As children, they must talk to find out what they need to know and to learn from the experience of others. As they grow older, they continue such learning by reading, listening to conversations and radio, attending the theater, looking at pictures, and by using the other means of communications. When they have developed ideas, problems, and enthusiasms of their own, they find it almost necessary to communicate them to others.

Pleasure of Self-Expression. For any individual, the next best thing to talking to friends is to have friends talk to him. It is all the better when the friends discuss subjects in which he is interested, use familiar language, express opinions or ideas with which he agrees, and say them more cleverly than he, himself, could. He likes to have them describe the adventures of persons like himself so that he can imagine the same adventures happening to him; or give information he can use to increase his income, make friends, or protect himself from accident or sickness. He enjoys remarks that are amusing and make him chuckle, especially when they are complimentary to him or to some group to which he belongs. When people talk sympathetically about such matters, almost anyone listens with such interest that he derives much of the pleasure of self-expression. The emotional effects are much the same. The fact that writers can and do talk to their readers in such ways, is the best general explanation of why persons read.

Imitating Others. In modern society nearly everyone reads something, if only the comic strips and newspaper headlines. Those who read do so partly in imitation of others. The barbershop, beauty parlor, and many other places provide reading matter to occupy people who have nothing else to do for the moment but wait. By taking a little more trouble to visit a public library or by paying a few cents, most people can read "what everyone else is reading" and so feel themselves up to date. The fact that reading matter is almost always available and that society expects everyone to read at least signs, letters, and newspapers, accounts for much of the reading that is done.

Leisure-time Occupation. Reading is also a substitute for many other kinds of communica-

tion. Most people with little education read only when they can accomplish their purposes in no easier way. For them, conversation, radio programs, motion pictures, and observation are easier and, generally, more fun. However, such people often turn to reading when there is no congenial person with whom to talk, no attractive film within reach, and no satisfactory program on the radio. Others, with more education and skill in finding what they want to read, prefer reading to the other kinds of communication. How much they prefer reading depends upon how well supplied they are with interesting reading matter and how well they can read. Those who prefer reading to any other form of communication do so because they can read whenever they like, whatever they like, for as long or as short a time as they like, as quickly or slowly as they like. Furthermore, they can find reading matter that deals with almost any subject in which they are interested. In all these respects reading differs from conversation, radio, and motion pictures.

Uses of Reading

As a Means of Escape. Among the many uses of reading is that it provides a means of getting away temporarily from anxieties. Probably more people read for this purpose than for any other. By following a comic strip, the

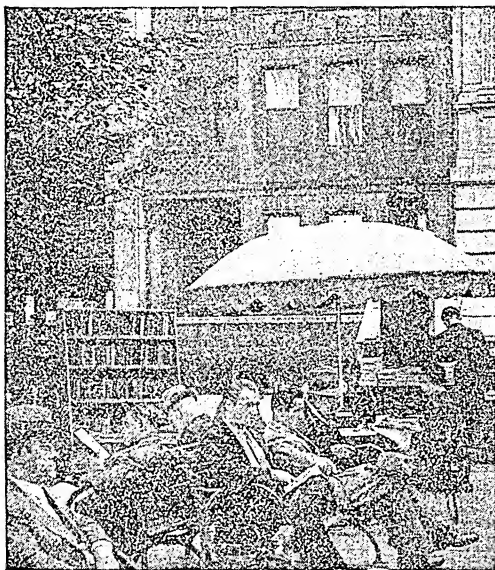


Photo: American Library Association

READING IN A CITY PARK

Reading goes on in all places at all times. Hundreds of people frequent Bryant Park, in the heart of New York's business district, seeking relaxation and pleasure through reading.

reader shifts his attention from his duties, quarrels, debts, or other worries. He lives for a

few moments in a wonderland, where restrictions can be wholly ignored, money grows on trees, and irritations are forgotten in the free atmosphere of make-believe. Nearly all the aimless reading which people do, without being conscious of any connection between what they are reading and their own concerns, hopes, and fears, affords some relief. Such reading should be taken in small doses. Too much of it leads to boredom. It should also be noted that the more active-minded persons, whose occupations prevent them from reading as much as they would like, find the same kind of pleasure even in long, serious books. Reading for relief has much the same effect upon society as have motion pictures and the radio. The many lonely worried people in the world, who are so depressed that they can scarcely carry on, are temporarily refreshed, as by a cool breeze on a hot day.

For Information. Many read to accomplish certain definite results. Familiar examples are the student's use of books to learn a subject, the housewife's use of a cookbook in making a cake, the builder's use of an architect's drawings in building a house, and the business man's use of a reference library to obtain facts needed in making decisions. Just as the aims which may thus be served vary widely, so do the publications which supply the information. They range from the news items which the reader uses to improve his conversation to the technical articles which the scientist uses to guide him in his laboratory experiments. This instrumental use of reading is probably the most widely known, because it is the best source for getting facts or ideas. A person in quest of information cannot be sure of getting the correct answer to a question from an acquaintance, a film, or a radio program. He can, however, be reasonably sure of finding it in print, if it can be found at all.

Reading to Confirm Beliefs. Another use of reading is to convince the reader that he is "right." What he reads serves to confirm and support what he already believes or wants to believe. This is important for it is one of the easiest ways to make the reader feel as he likes to feel. All normal people like to feel that they are right, respected by others, and powerful enough to get what they want. When they read articles and books which make them feel this way, the effect is much the same as though something had happened to multiply their devoted friends or to increase their safety or power. The schoolboy who is a good musician but no athlete feels much better about his lack of athletic prowess when he reads a story in which the hero is a musician who wins friends. Such reading may be called reinforcement reading. The schoolboy's story reinforces or strengthens his belief that it is better to be a good musician than a good athlete, even though

most of his acquaintances may not agree with him. In the same way, a housewife who is bored by her daily work and cannot afford the travel, clothes, or amusements she wants, or expensive schools for her children, feels better after reading a magazine story or novel about a housewife in a similar position who earns the respect of her family and friends by her patience, hard work, and self-sacrifice. Such reading makes her proud to be a housewife and makes her forget her minor disappointments.

The reinforcement effect of reading is interesting because it explains how reading can change the reader's attitudes. The effect of propaganda in times of war or other emergency can be explained in the same way. Propaganda which changes people's attitudes consists of two elements. One seeks to make them think better of themselves by reinforcing their belief that they are intelligent, respected, and powerful. If it succeeds in doing this, it makes them more sympathetic toward the writer and the opinions he expresses. The other element tries, in various ways, to make the readers believe that a certain country or individual stands for the same things they stand for, if they only knew it; and then gives many illustrations to prove the contention.

Imaginary Adventure. A fourth use of reading is to produce the excitement of imaginary adventure. Whether the excitement is great or small depends upon how easily the reader can put himself in the place of the hero. If the chief character is of the reader's own sex and age, if his or her interests are the same as those of the reader, and if the scrapes the character gets into are those the reader has actually experienced, not much imagination is required to make the reader feel that the adventures are real. His breath comes short, his blood pressure rises, and he can't take his eyes from the page.

The stronger emotions of physical danger, desperate courage, and triumph over cunning adversaries are seldom felt in civilized life. Hence the millions who can experience such emotions by reading, listening to the radio, or seeing a film drama find the diversion almost necessary to relieve the dullness of their normal lives. The greatest excitement is commonly found in books and magazines where the author fills in the details which make the characters and their adventures convincing. No matter what their education may be, men, women, and children love a good story describing people like themselves who perform deeds and reap the rewards they themselves would like to perform and receive.

Other Reading Effects. Many other uses and effects of reading might be added, such as the use of literary masterpieces to sharpen the reader's observations of life or to provide him with literary art, the sheer excellence of which he enjoys. Often, one or more of the four

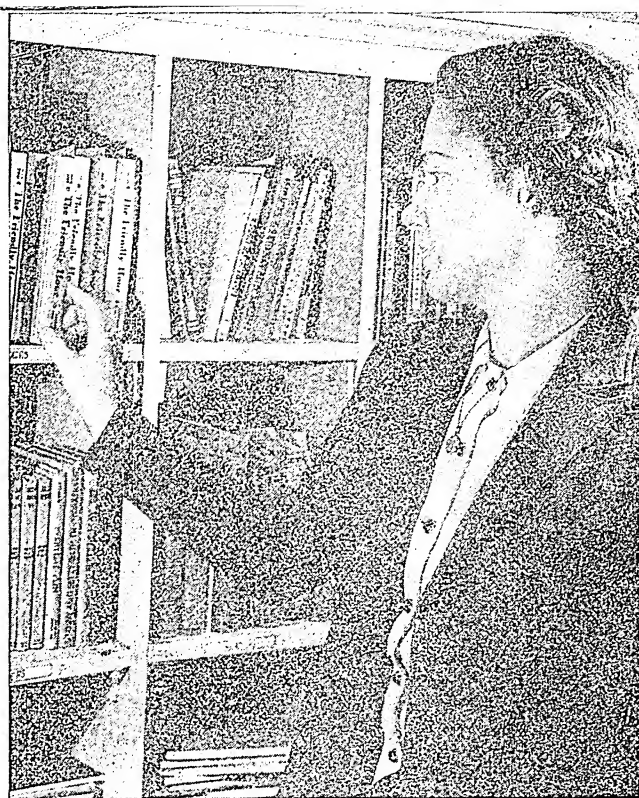


Photo: Ellis O. Hinsey

LEARNING TO READ

The teacher knows there are as many ways of reading as there are readers.

major uses are combined. For example, the use of reading as an escape mechanism generally accompanies the other three uses.

Abuses of Reading. There are many serious abuses of reading. Like any other means used for swaying people, reading may influence them for the worse as well as for the better. It is a dangerous mistake to suppose that all writers have good motives. Probably more publications are produced by writers with selfish interests than by those who write unselfishly, for the dishonest writer is more likely to benefit directly than is the honest one. Newsstands are flooded with publications which urge their readers to take short cuts with their consciences, to yield to easy temptations, to accept oversimplified solutions of the problems they face as citizens, and to avoid responsibilities which are much easier to shirk than to meet.

It is also a common mistake to suppose that reading is good, in and of itself. For many, reading has fostered high ideals, supplied information needed to solve important problems, as in the arts and sciences, and has given the inspiration needed to realize their ambitions. However, there are probably others whose reading has debased their ideals, supplied misinformation, and killed their ambitions to accomplish socially useful results.

To conclude that one should not read because reading is frequently abused would be to miss the point entirely. The dangers of reading can be avoided and its benefits secured by any

reader who relies upon authors wiser than himself, reads critically, and is as careful to prevent a persuasive writer from misleading him as he is to see through a clever, but dishonest, talker.

Motives of Individual Readers. To discover the motives of individual readers, or of large groups of readers, demands special training in such fields as psychology, sociology, literary criticism, political science, history, and economics. As no one can very well master all these subjects, the work of discovering why people read must be done by various kinds of specialists working together. If, then, the facts about reading are so hard to secure, it may be asked, why do students bother to secure them? Why is reading a matter of such importance? What purposes are served by such facts beyond satisfying an idle curiosity?

The more a writer or editor knows about the types of publications that appeal to various kinds of persons, the more likely he is to succeed in his business, the more popular his publications, and the greater his circulation will be. Also, the more a newspaper or magazine editor knows about readers, the more money he can make by selling advertising space. If he makes his publication appeal to those whom commercial concerns want to reach, he can more readily attract the advertisers. Knowing about readers also enables writers and editors to present their facts and ideas more effectively. In writing textbooks, it is necessary to suit the vocabulary and sentence structure to the age of the readers. In writing for others, it is no less important to know what kinds of explanation will be clear and what arguments will be persuasive.

In the highly paid field of propaganda, most writers are aided by social psychologists who understand public opinion (which see) and can explain its changes. Changes in public opinion directly affect all aspects of life in a democracy, its politics, financial system, morals, and much else. Therefore it is necessary to know everything possible about the connection between what people are reading, and what they are thinking, to tell how public opinion is changing.

There are many basic questions about the uses and effects of reading which have not yet been answered. They are hard to answer, for reading is almost never the sole cause of any one effect. Is it known to what extent readers voluntarily read articles and books expressing views with which they do not agree? What is the effect of reading which presents views that are opposed by the radio and motion picture? Is it likely that a man's reading will have much effect on him if it expresses ideas contrary to those presented by the other means of public communication?

What is Read

Generally speaking, about 10 per cent of the population of this country are nonreaders;

90 per cent read newspapers with fair regularity; about 50 per cent read one or more magazines; and about 20 per cent read one or more books a year. A fair guess as to the proportion of adults who have never read a book, in the ordinary sense of the term, is about 35 per cent. The proportion of readers of serious books is probably no higher than 2 per cent.

Kinds of Publications Read. It is possible to report the number and kinds of publications read by various groups at any given time, but such numbers are always out of date before they can be printed. Therefore, a truer picture of group differences in reading presents relative differences, rather than actual numbers. Relative differences do not change much during a ten-year period, but absolute numbers do.

There are three ways of approaching the question of "who reads what." The easiest and the least reliable is to assume that the self-interest of publishers is enough to prevent them from bringing out publications that are not read, and that every publication is read to some extent by the persons for whom it is intended. The publications issued each year can be easily classified, for they are reported in the *Biennial Census of Manufactures*, put out by the United States Department of Commerce. This method shows what is read only in that it shows what there is to read. It does not, however, tell anything about the reading of older books, nor does it give more than a faint suggestion as to who the readers are. For example, new book titles appear in a typical year about as follows, giving a rough estimate of the relative attention paid by American readers in general to various subjects:

Fiction	1,300
Poetry and drama	800
Philosophy and religion	700
Sociology and economics	600
Juvenile	500
Science and medicine	500
Biography	500
History	400
Fine arts and music	300
Travel and geography	200
Games and sports	200
All others	800

The corresponding figures for copies of magazines sold in each subject class run to hundreds of thousands and even millions in some instances. The figures are given in round numbers:

Confession and other pulp magazines	3,900,000
Detective and adventure	3,300,000
All radio and moving picture	2,000,000
Five-cent weeklies	7,400,000
Mediocre and medium-priced monthlies	4,600,000
Humorous weeklies	200,000
Religious	300,000
Fine arts (nontechnical)	160,000
Parents', women's, home	18,500,000
Juvenile	1,600,000
Leading monthly quality magazines	500,000
Fashionable, high-priced magazines	450,000



EARLY ADVENTURES IN READING

As soon as children can read, books become a source of never-ending delight. *Above:* A boy and girl, absorbed by the contents of their books, are unaware of all that goes on

around them. *Below:* Kindergarten children, fascinated by picture books, are anxious to learn how to read for themselves without the help of parents or teachers.

Photos: Arthur C. Allen; Rochester (N. Y.) Public Schools



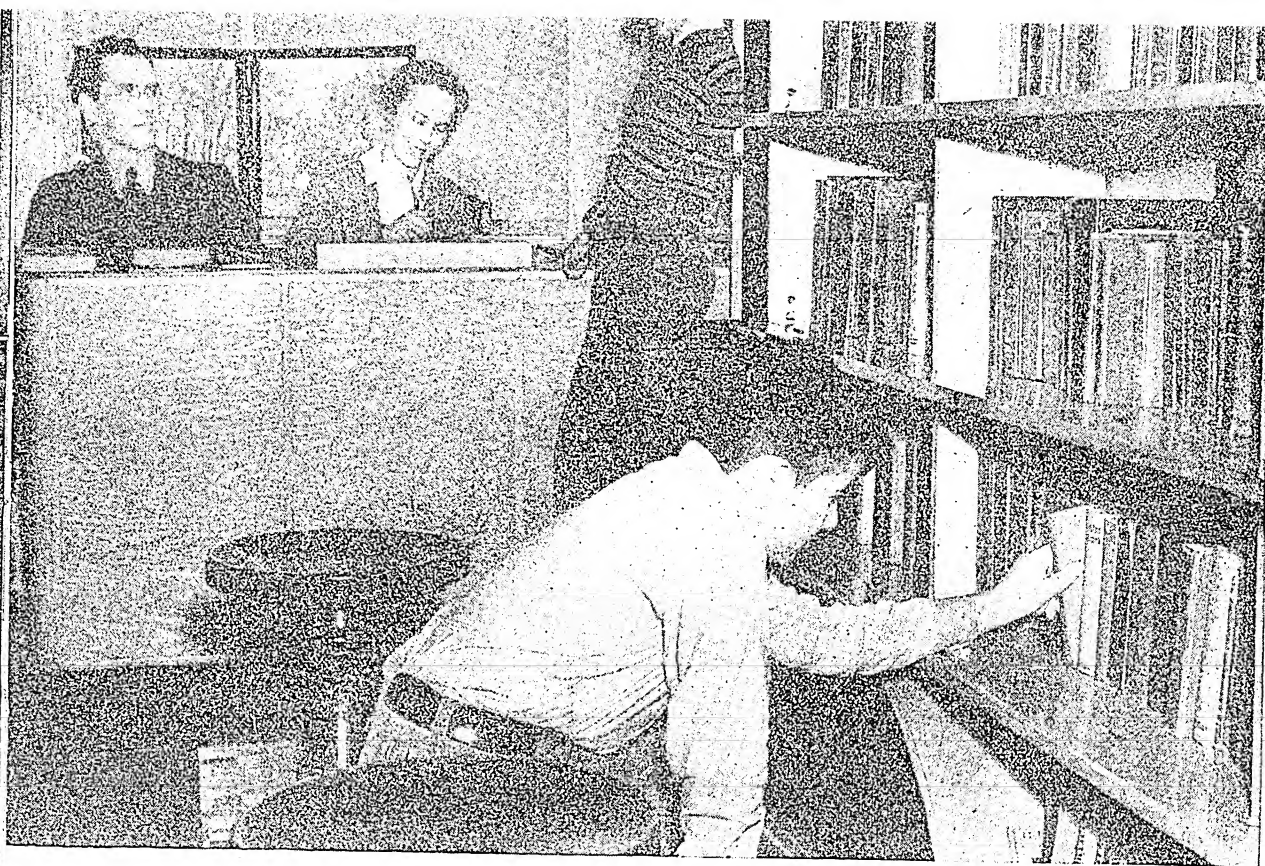


Photo: American Library Association

MAKING READING AVAILABLE

Availability plays an important part in determining what and how much people read. Today, bookmobiles go into the rural districts and make books available for all who want to read. Pictured here is the interior of a bookmobile being patronized by two country boys.

Monthly reviews.....	300,000
Popular science and mechanics.....	1,700,000
Weekly news.....	2,600,000
Liberal and radical.....	170,000
Sports and outdoors.....	840,000
Fraternal.....	2,000,000
Farm.....	7,700,000
Travel and foreign lands.....	1,120,000
Business, commerce, and finance.....	720,000
Health.....	340,000

Distribution and Circulation of Books. Another way of determining who reads what is to consider the distribution and circulation of such important agencies as public libraries, rental libraries, bookstores, newsstands, and book and magazine subscription agencies. Of course, the public library is by all odds the best informed about its patrons, but library records do not apply to magazines and newspapers. Nor do they cover the many people who buy their own books and do not use the public library. Yet public library records show fairly well what kinds of books are read by book readers in general, because about 40 per cent of them go there for their books. The table (opposite) classifies the circulation of four selected

branches of the New York Public Library, which probably represents the nation as well as any other large library. It shows that fiction books are read much more widely than others, and that students and housewives do most of the reading.

Interviewing Readers. A third and the best means to find out who reads what is to send a staff of interviewers through a number of typical communities to ask the members of each household what they read. The resulting picture of a community's reading is shown in the following table, which reports the findings of such a survey. The most popular types of books and magazines and the kinds of readers most attracted to each are much the same in all American communities where the supply of publications is about normal.

From such facts about magazines and books read by men and women of different occupations, one can form a useful notion of the nature and scope of reading in modern society. The typical uses of reading are clearly implied. All serve the purpose of social communication, which everyone needs. However, to know what

Classification of Books

SEX AND OCCUPATION OF BORROWERS	FICTION	PHILOSOPHY	RELIGION	SOCIAL SCIENCE	PHILOLOGY	PURE SCIENCE	USEFUL ARTS	FINE ARTS	LITERATURE	BIOGRAPHY	TRAVEL	HISTORY
Male												
Professional.....	2.9	9.3	13.1	5.2	4.7	4.7	3.6	14.3	5.2	6.1	6.3	6.7
Students.....	14.3	23.3	12.5	23.9	22.8	31.6	27.1	21.3	18.9	20.7	23.9	30.4
Salesmen and shopkeepers.....	2.4	2.9	3.1	6.4	6.7	5.5	5.3	4.7	2.9	4.8	5.9	3.9
Clerks.....	6.1	10.5	1.9	10.2	8.5	6.3	10.2	4.4	5.9	6.9	4.8	9.0
Skilled trades.....	7.0	5.2	14.5	6.6	9.6	10.1	6.2	9.2	3.5	6.7	11.3	7.1
Unskilled labor.....	3.1	2.2	8.2	7.9	0.9	5.7	3.2	2.3	2.0	2.3	3.7	4.3
Unknown.....	2.7	6.3	4.0	5.7	4.6	6.1	4.3	4.6	3.7	3.8	3.6	5.1
Total males.....	38.5	59.7	57.3	65.9	57.8	70.0	59.9	60.8	42.1	51.3	59.5	66.5
Female												
Professional.....	5.6	5.1	15.9	2.4	7.2	5.3	1.2	7.9	7.7	9.3	5.0	2.9
Students.....	18.4	10.5	10.7	15.9	16.7	13.0	10.5	14.2	23.1	12.4	14.1	18.8
Clerks and stenographers.....	14.4	9.7	7.0	8.8	7.6	5.1	10.5	5.9	15.1	11.1	9.2	5.4
Skilled trades.....	3.9	3.1	0.7	0.1	0.6	0.5	3.4	1.5	1.3	3.5	0.8	0.9
Unskilled labor.....	4.4	3.7	1.2	0.6	5.0	.....	2.7	0.2	1.1	1.1	3.5	0.8
Housewives.....	11.0	5.1	5.6	3.2	3.8	5.0	9.1	6.5	4.4	6.4	6.1	3.2
Unknown.....	3.8	3.1	1.6	3.1	1.3	1.1	2.7	3.0	5.2	4.9	1.8	1.5
Total females.....	61.5	40.3	42.7	34.1	42.2	30.0	40.1	39.2	57.9	48.7	40.5	33.5
Total.....	100	100	100	100	100	100	100	100	100	100	100	100
Number of books in sample.....	16,222	488	174	777	85	375	410	1,004	1,524	622	325	555

Percentage Distribution of Magazines

OCCUPATION AND SEX		Type of Literature →								
		Magazines								
		DETECTIVE ADVENTURE	WEEKLY NEWS	MOVIE, LOVE, RADIO	5¢ WEEKLIES	FICTION MONTHLIES	RELIGIOUS	PARENTS', WOMEN'S, ETC.	ALL OTHERS	TOTAL
Unemployed	Male	33.5	1.9	9.9	8.0	6.2	1.5	6.5	13.0	80.5
	Female	2.0	2.7	18.8	13.4	5.4	2.0	18.8	7.4	70.5
	Total	23.5	2.1	12.7	9.7	5.9	1.7	10.4	11.2	77.2
Unskilled Labor	Male	24.4	1.9	9.3	11.4	7.1	1.7	3.8	17.9	77.5
	Female	8.3	1.4	44.0	6.5	5.7	1.1	11.1	6.1	84.2
	Total	19.8	1.8	19.2	10.0	6.7	1.5	5.9	14.5	79.4
Skilled Trades	Male	8.9	5.4	4.0	22.0	8.5	2.3	6.3	22.6	80.0
	Female	2.4	4.0	7.3	18.5	13.7	1.6	29.1	5.6	82.2
	Total	8.1	5.2	4.4	21.6	9.2	2.2	9.2	20.4	80.3
Housekeepers and Housewives	Male	4.4	5.9	14.7	1.5	1.5	8.8	19.1	11.8	67.7
	Female	2.8	3.2	16.5	13.1	8.0	3.8	26.9	8.5	83.7
	Total	2.9	3.3	16.4	12.8	8.8	3.9	26.7	8.5	83.3
Shopkeepers, Salesmen	Male	6.6	6.1	3.4	25.0	9.1	0.8	7.4	23.5	81.9
	Female	2.8	5.6	13.0	13.0	6.5	2.8	25.0	11.0	79.7
	Total	5.9	6.0	5.2	22.8	8.6	1.2	10.7	21.2	81.6
Stenographers, Clerks	Male	8.8	5.9	7.4	23.5	9.3	1.0	5.9	20.0	81.8
	Female	1.4	1.7	14.8	17.4	11.1	1.4	23.9	7.7	79.4
	Total	4.1	3.2	12.1	19.6	10.5	1.3	17.3	12.3	80.4
Students	Male	20.2	1.3	2.9	8.2	4.0	0.5	3.1	20.4	60.6
	Female	2.3	2.2	14.4	8.4	4.0	0.4	13.1	6.6	51.4
	Total	11.8	1.8	8.2	8.3	4.0	0.5	7.8	14.0	56.4
Professional	Male	1.2	5.5	0.7	19.9	8.1	3.2	6.9	33.3	78.8
	Female	2.4	7.2	2.0	11.2	10.0	1.2	24.2	13.7	71.9
	Total	1.6	6.0	1.1	17.3	8.7	2.6	12.2	27.3	76.8
Total	Male	16.2	3.4	5.5	14.9	6.9	1.7	5.2	21.2	75.0
	Female	3.2	3.0	17.9	11.9	7.9	2.6	22.4	8.0	76.9
	Total	9.3	3.2	12.0	13.3	7.4	2.1	14.2	14.4	75.9

satisfactions are obtained by reading does not fully explain why some people read and others do not, nor why any one person reads this and not that.

Selecting Reading Matter

Availability. What people generally read is mainly determined by what is available with little or no effort on their part. A book in the hand, unless it is impossibly dull, stands a far better chance of being read than a book in the public library. For this reason the activities of news vendors, magazine agencies, rental and public libraries, and book dealers of all kinds have an influence upon the selection of reading

matter that can scarcely be exaggerated. The practice of reading what one sees lying about or what is obtained from one's friends is not highly intelligent, but is fairly universal. In terms of the nation as a whole this tendency explains the wide differences among the publications available to the residents of various regions. Cities supply a larger variety of publications than do rural areas, for the denser the population, the lower the costs of distribution. One can say, therefore, that what a person reads and, to some extent perhaps, the amount that he reads, depends upon where he lives. For the scholar, it is a serious matter if his health makes him move to a place where books are scarce.

Percentage Distribution of Books

Type of Literature										NUMBER BOOKS AND MAGAZINES
Books										
GOOD FICTION	OTHER FICTION	JUVENILE	PSYCHOLOGY	BIOGRAPHY, TRAVEL	SOCIAL PROBLEMS	LITERATURE	ALL OTHERS	TOTAL	TOTAL BOOKS AND MAGAZINES	
3.4	8.0	0.6	1.5	1.2	.....	0.6	4.1	19.4	100	323
11.4	11.4	3.4	1.3	0.7	0.7	.....	0.7	29.6	100	149
5.9	9.1	1.5	1.5	1.1	0.2	0.4	3.0	22.7	100	472
2.9	8.0	0.6	2.1	0.7	0.1	0.6	7.5	22.5	100	1,404
3.4	4.3	2.5	2.0	1.4	.....	0.4	1.8	15.8	100	559
3.1	6.9	1.2	2.1	0.9	0.1	0.5	5.9	20.7	100	1,963
3.2	5.6	0.2	1.5	2.6	0.5	0.6	5.8	20.0	100	868
4.8	8.1	1.6	0.8	2.4	.....	.....	.....	17.7	100	125
3.4	5.9	0.4	1.4	2.6	0.4	0.5	5.0	19.6	100	993
4.4	10.3	4.4	4.4	1.5	.....	.....	7.4	32.4	100	68
4.9	4.2	1.0	2.0	0.8	0.2	0.5	2.7	16.3	100	3,029
4.9	4.3	1.0	2.1	0.8	0.2	0.5	2.8	16.6	100	3,097
3.8	5.5	0.6	2.1	1.3	0.2	1.3	3.2	18.0	100	472
9.3	7.4	.....	.....	.....	.....	0.9	2.8	20.4	100	108
4.8	5.9	0.5	1.7	1.0	0.2	1.2	3.1	18.4	100	580
6.9	5.9	0.5	1.0	1.5	.....	1.0	1.5	18.3	100	204
9.4	6.0	1.1	0.9	1.7	0.6	.....	0.9	20.6	100	351
8.5	5.9	0.9	0.9	1.6	0.4	0.4	1.1	19.7	100	555
7.1	10.1	14.7	0.9	2.0	0.1	0.4	4.1	39.4	100	1,120
12.1	10.8	18.4	0.1	1.9	0.1	1.2	3.9	48.5	100	983
9.5	10.4	16.5	0.5	1.9	0.1	0.8	4.0	43.7	100	2,103
2.8	1.9	0.4	3.2	2.8	1.8	0.9	7.4	21.2	100	567
8.4	3.6	.....	7.2	2.8	.....	2.4	3.6	28.0	100	249
4.5	2.5	0.2	4.4	2.8	1.2	1.3	6.2	23.1	100	816
4.2	7.1	3.5	1.8	1.7	0.4	0.7	5.7	25.1	100	5,026
6.7	5.8	4.2	1.8	1.2	0.2	0.6	2.6	23.1	100	5,553
5.5	6.4	3.9	1.8	1.4	0.3	0.6	4.1	24.0	100	10,579

Readability. Readability is a loose term, covering several qualities, such as difficulty of text, kind of humor, and sympathy which the author arouses. As applied to textbooks and to writing for adults who are only beginning to read, readability has been largely identified with the simplicity of the text. It is obvious, however, that a child's book is no more readable to an intelligent adult than a technical book on philosophy is to the child. Neither makes much sense to the wrong kind of reader.

In selecting reading matter, the normal person usually looks over the books on his table and chooses the book which makes the strongest appeal in its first few paragraphs. The wide

popularity of the radio drives home the fact that for most adults, the task of reading even newspapers and the lighter magazines is discouragingly difficult. Most people are not able to read with enough ease to enjoy it.

Almost any person in a mood to read will read anything that is available if no choice is required. If two publications are available, he will select the more readable one. If, however, both are equally readable, he will choose the one which treats of a subject in which he is the more interested. The many exceptions are those who want to read something in particular, as contrasted with the great majority who merely want something to read. A student or other

serious reader will, of course, take pains to find the particular book he needs. For readers in general, it matters less what the publication is about than how it is written, and it matters less how it is written (unless the reader cannot read it) than how easily available it is.

Subject Interest. What people want to read about is an interesting question in itself, even though the connection between what they want and what they read is not very close. The reason why more people do not read what they prefer is that they cannot easily find publications dealing with such subjects and written to their taste. It is easy to learn what interests people by asking them. The subjects appealing to typical groups cover a wide range and are generally consistent with their sex, occupation, education, age, and place of residence.

For one example, take the difference in the subject interests of two very different groups of people—women high-school teachers in the city of Chicago, and farmers and tradesmen in selected villages of Vermont. The two groups differ in sex, occupation, amount of schooling, age, and type of community in which they live. As is to be expected, the subjects each group prefers to read about are very different. The one list includes subjects of high interest to Chicago teachers but of low interest to Vermont farmers. The other list names subjects of high interest to the farmers and of low interest to the teachers. Each list of subjects suggests the background, activities, and interests of each group.

**SUBJECTS PREFERRED BY WOMEN
HIGH-SCHOOL TEACHERS, CHICAGO**

Statesmen and Politicians
Authors
Royalty and Social Leaders
United States Foreign Affairs
Modern Civilization
Changing Status of Woman
Interesting Places Abroad
Customs of Other Days and Other Lands
Comments on Marriage and Divorce
Eugenics and Birth Control
Elementary and Secondary Education
College and Higher Education
Writers and Writing
Language and Conversation
Civic Beauty and Architecture
Music
Successful Marriage

**SUBJECTS PREFERRED BY FARMERS
AND VILLAGE TRADESMEN, VERMONT**

Successful Business Men and Women
Military and Naval Heroes
Problems of State and City Government
Citizenship
Preparedness
Labor and the Labor Market
Business Management
Mechanical Inventions
Developments in the Automobile Industry
Developments in Farming

Plant Life
Rural Problems
Criticisms of the Church
Superstitions and Beliefs
The Home Garden
Household Management and Food Preparation

Such studies of group interests and a comparison of group interests with the materials actually read can help publishers, editors, teachers, advertisers, librarians, and many others to provide each group with the kind of reading matter that will be read with the most satisfaction.

How to Read

Reader's Purpose. There are many ways of reading the same thing. Some methods are efficient, others are not, the efficiency depending upon the reader's purpose. Unless the person reading adapts his method to the particular publication in hand and to his needs, he is likely to miss the satisfaction he might otherwise obtain, and frequently even waste his time.

In this respect methods of reading are like methods of conversation. There is, however, an important difference. In conversation one must often listen as politely as possible to a tedious talker. In reading no such painful experience is necessary, for the reader can simply close his book if it is dull. But other comparisons apply. Some conversationalists prattle on interestingly enough and so simply that their listeners have to exert no effort to follow them. In many cases a personal letter, human interest item in a newspaper, magazine story, novel, poem, or drama has the same effect upon the reader. However, he has the great advantage of being able to regulate his speed. If he is amused, he can read as slowly as he likes or can exert himself and extract the meaning in a small fraction of the time required to hear it read over the radio, for instance. In reading of this type, the reader seldom tries to remember what he reads. He simply enjoys it.

Reading to Remember. A second kind of reading is more serious, for example, that which gives timely and useful facts. If it fills a need, the reader pays such close attention that no word or meaning escapes him. He assimilates and remembers it clearly as long as it can be of use. Examples are the more solid news dispatches appearing in the daily press, important business letters, articles giving rules or directions, and books dealing with important problems. In such cases the speed of reading is inconsequential; the clarity of meaning is of great importance.

Interviewing an Author. By using his mind, memory, imagination, common sense, and keenest perception of what he wants to learn, a reporter interviewing a prominent person or authority shapes the interview to his purpose as best he can in the time available. He decides

in advance what questions to ask and the order in which to ask them. The same steps are necessary in interviewing an author, which is what the reader does when he reads his works. The benefits of reading such an author are not confined to remembering what he has written. Rather, they consist in learning how he thinks. This can be achieved only after the reader understands exactly what the author says, thinks the writer's thoughts after him in much the same order as he presents them, and raises pertinent questions.

Reading Rapidly. Everyone whose occupation obliges him to read widely, must teach himself to do so rapidly. There is no one best method of doing this. The problem lies in giving the eyes as little work as possible, the mind as much as is required. One common device is to read only as much of each paragraph as is needed to suggest the meaning and then skip to the next. Another device is to run the eye down the center of each page, reading what is seen, and filling in (that is, making up) what is not seen. Practice in reading by the clock and then writing down what one remembers will teach fast reading.

Selecting Important Facts. The first essential in selecting important facts is to have something in mind to which to relate them. Facts worth remembering are recalled for some purpose. The student who studies successfully for an examination organizes his facts with reference to the kinds of questions he will be asked to answer. Daily news articles are best remembered when the reader relates the given facts to topics he is likely to discuss with his friends. The same principle applies to other reading. The more numerous and more varied the situations to which he connects the facts he reads, the more easily and the more usefully he can recall them.

Reading to Understand. To grasp the whole context of what is read, it is obviously helpful to make a written outline. The slight effort required for the reader to make notes as he reads adds greatly to his comprehension, far more than would be supposed by one who has never formed the habit. Having outlined an article or book in his own words, the reader should again relate it to some probable occasion for future use. The more connections of this kind he can make, the more easily he can recall the article as a whole.

How to understand a truly great book cannot be told properly by a few rules. The fullness of understanding depends upon how much the reader wants to understand, and upon how long and how hard he works. It goes without saying that he cannot understand a technically difficult book unless he is already familiar with the general subject which it treats. Probably the best published advice on this subject is contained in Mortimer J. Adler's *How to Read a*

Book, which recommends at least three careful readings of any book important enough to be fully mastered. In the first reading, the reader should try to understand the book's structure. To help him in this, he should state in his own words what the book is about, then outline it, and summarize the meaning of each part of the discussion in relation to its main ideas. In the second reading, he should analyze the book in detail—the basic words, important sentences, and chief arguments found by connecting the important sentences. In the third reading, the reader may undertake to criticize the author for illogical reasoning, for misstatements of fact, or for serious omissions. Each such criticism should be supported by evidence.

What to Read

"Best Books." Most readers are fond of telling other people what to read, and lists of best books are continually appearing. As everyone knows, the recommendations of friends have much to do with what people read.

All this is to say that the words *best books* mean nothing at all unless the compiler states for whom, for what purpose, and under what conditions the books are so described. These points are important, because it is just as impossible to choose the best book for everybody as it is to choose the best husband, wife, hat, or shoes. The question of what to read can be answered properly only by the reader himself, who must always give the final answer. Others can assist, especially when the reader has tried to help himself and is not satisfied with the results. Whenever an individual is satisfied with what he reads or does not read, he probably pays no attention to recommendations anyway.

Classified Books for Reading. Books which various types of readers may like are listed at the end of this article. Most of them are books which cultivated people have read, and are likely to be discussed. Hundreds of persons interviewed in a large public library made it clear that each of these books was read with great satisfaction by many normal persons. The books have a general appeal, describing situations common in the lives of many readers. They are well written. Each of the authors had something to say and said it as clearly, honestly, and interestingly as he could. The books are classified according to the uses of reading already discussed. If a reader knows why he wants to read, the three classifications may help him to select wisely. All the books are useful for relief, and only one of the twelve classes contains books of instrumental value which try to solve definite problems.

Books to Help Solve Problems

BOND, F. F. *Give Yourself Background*. McGraw, 1937.

CARNEGIE, DALE. *How to Win Friends and Influence*

- People*. Simon & Schuster, 1937.
 DIMNET, ERNEST. *Art of Thinking*. Simon & Schuster, 1928.
 DURANT, WILLIAM. *Story of Philosophy*. Simon & Schuster, 1933.
 VAN LOON, HENDRIK. *The Arts*. Simon & Schuster, 1940.

Books to Provide Thrills

- ALLEN, HERVEY. *Anthony Adverse*. Grosset, 1938.
 FLEMING, PETER. *Brazilian Adventure*. Scribner, 1934.
 FORESTER, C. S. *Captain Horatio Hornblower*. Little, 1939.
 NORDHOFF, C. B., and HALL, J. N. *The Hurricane*. Blue Ribbon Books, 1938. *Mutiny on the Bounty*. Chapman, 1936.
 ROBERTS, KENNETH. *Northwest Passage*. Doubleday, Doran, 1937.
 STEVENSON, R. L. *Treasure Island*. Grosset, 1939.

What to Dream About

- DANE, CLEMENCE. *The Moon is Feminine*. Doubleday, Doran, 1938.
 DE LA MARE, WALTER. *Memoirs of a Midget*. Collins, 1934.
 NATHAN, ROBERT. *One More Spring*. Overbrook, 1935.
 STEPHENS, JAMES. *Crock of Gold*. Macmillan, 1937.

What Kind of Life is Best

- CURIE, EVE. *Madame Curie*. Garden City Publishing Co., 1939.
 HEMINGWAY, ERNEST. *For Whom the Bell Tolls*. Scribner, 1940.
 LIN, YU-T'ANG. *The Importance of Living*. Reynal, 1937.
 MYERS, L. H. *The Root and the Flower*. Harcourt, 1935. *Pool of Vishnu*. Harcourt, 1940.
 ROLLAND, ROMAIN. *Jean Christophe*. Modern Library, 1938.
 SAINT EXUPERY, ANTOINE DE. *Wind, Sand, and Stars*. Reynal, 1940.
 VALLERY-RADOT, RENE. *Life of Pasteur*. Garden City Publishing Co., 1937.

What's Wrong with the World

- MUMFORD, LEWIS. *Faith for Living*. Harcourt, 1940.
 STEFFENS, LINCOLN. *Autobiography*. Harcourt, 1936.
 STEINBECK, JOHN. *Grapes of Wrath*. Viking, 1939.
 VAN PAASSEN, PIERRE. *Days of Our Years*. Dial Press, 1940.
 ZWEIG, ARNOLD. *Education before Verdun*. Sun Dial, 1938.

What's Right with the World

- BEEBE, WILLIAM. *Jungle Peace*. Modern Library, 1925.
 HUDSON, W. H. *Green Mansions*. Sun Dial, 1938.
 RAWLINGS, MARJORIE. *The Yearling*. Scribner, 1940.
 SALTEN, FELIX. *Bambi*. Grosset, 1940.
 SMART, C. A. *R.F.D.* Norton, 1938.

Queer People

- DAY, CLARENCE. *Life with Father*. Chatto, 1938.
 HALSEY, MARGARET. *With Malice toward Some*. Simon & Schuster, 1938.
 HOFFMAN, RUTH, and HELEN. *We Married an Englishman*. Carrick, 1938.
 ROSTEN, LEO. *Education of H*Y*M*A*N K*A*P*L*A*N*. Harcourt, 1937.

Natural People

- CARROLL, G. H. *As the Earth Turns*. Macmillan, 1933.
 CORBETT, ELIZABETH. *Mr. and Mrs. Meigs*. Appleton-Century, 1940.

- LUTES, DELLA. *Country Kitchen*. Little, 1936.
 STRUTHER, JAN. *Mrs. Miniver*. Harcourt, 1940.

What Life Means

- CARREL, ALEXIS. *Man, the Unknown*. Harper, 1939.
 HILTON, JAMES. *Lost Horizon*. Grosset, 1940.
 MORGAN, CHARLES. *The Fountain*. Knopf, 1935.
 WILDER, THORNTON. *Bridge of San Luis Rey*. Grosset, 1937.

What to Believe In

- DOUGLAS, LLOYD. *Magnificent Obsession*. Houghton, 1929.
 LINK, HENRY. *Return to Religion*. Macmillan, 1936.
 PAISLEY, E. W. *Sanctuary*. Dutton, 1940.
 RHOADES, WINIFRED. *Meeting the Challenge of Life*. Lippincott, 1939.

Why People Behave as They Do

- MAUGHAM, SOMERSET. *Of Human Bondage*. Garden City, 1939.
 POWYS, J. C. *Wolf Solent*. Cape, J., 1938.
 WEBB, MARY. *Precious Bane*. Dutton, 1935.
 WOLFE, THOMAS. *Look Homeward, Angel*. Grosset, 1939.

How People Feel in Common Situations

- CRONIN, A. J. *The Citadel*. Grosset, 1940.
 DEEPING, WARWICK. *Sorrel and Son*. Grosset, 1940.
 MAUROIS, ANDRE. *Ariel*. Appleton, 1928.
 STEINBECK, JOHN. *Of Mice and Men*. Modern Library, 1938.
 WATKIN, L. E. *On Borrowed Time*. Sun Dial, 1939.

As the books listed do not help the reader in search of publications on particular vocations or hobbies, he should ask a librarian to supply a list of readings on the special subject in which he is interested. D.W.

Related Subjects. The reader is also referred to the bibliography at the end of the WXYZ volume and to the following subjects:

American Literature	German Literature
Biography	Hobbies
Books and Bookbinding	Irish Literature
Canadian Literature	Language
Dictionary	Library
English Literature	Literature
Essay	Novel
Fiction	Poetry
French Literature	Prose

Books about Reading

- ADLER, MORTIMER J. *How to Read a Book*. Simon & Schuster, 1940.
 BONNY, H. V. *Reading*. Philip, A. J., 1938.
 BUSWELL, GUY T. *How Adults Read*. University of Chicago Press, 1937.
 CARNOVSKY, LEON. "The Relation of Reading Interest and Actual Reading." *Library Quarterly*, 4:76-110.
 COWLEY, MALCOLM. *Books that Changed Our Minds*. Doubleday, Doran, 1939.
 HAYGOOD, WILLIAM C. *Who Uses the Public Library?* University of Chicago Press, 1938.
 WAPLES, DOUGLAS. *People and Print*. University of Chicago Press, 1938; and TYLER, RALPH W. *What People Want to Read About*. American Library Association and University of Chicago Press, 1931; and BERELSON, BERNARD, and BRADSHAW, FRANKLYN R., *What Reading Does to People*. University of Chicago Press, 1940.
 WILSON, LOUIS R. *The Geography of Reading*. American Library Association and University of Chicago Press, 1938.

READING, *red' ing*, PA., a manufacturing city and county seat of Berks County, is situated in the southeastern part of the state, on the Schuylkill River.

Excellent highways wind about the mountains in the vicinity of Reading. From the summit of Mount Penn (1,100 feet) and that of Neversink Mountain (878 feet) may be seen magnificent views. The city's park system covers 600 acres. Population, 110,568 (1940).

Transportation. Railway transportation is provided by the Pennsylvania and the Philadelphia & Reading. There is electric interurban and motorbus service. Motor-truck lines furnish daily service to New York, Philadelphia, and other points. Reading is on seven state highways. On Pottsville Pike, six miles north of the city, is an airport.

Industry. Reading is the third industrial city of Pennsylvania. It is near large anthracite coal fields and great deposits of limestone and iron ore. The region produces an abundance of fruit, grain, and vegetables. Iron and steel are important factors. The chief manufactures are knit goods and hosiery, silk underwear, steel castings, brick, builders' hardware, and machinery. The immense locomotive and car shops of the Philadelphia & Reading Railway have a payroll of about 3,000 men.

Education. Advanced education is provided by Albright College, and by extension from the University of Pennsylvania and Pennsylvania State College.

History. In 1748 two sons of William Penn platted the town and named it for the English city of Reading. During the Revolutionary War, it was a depot of military supplies, and the site of the camp in which were detained the Hessian prisoners captured at the Battle of Trenton. The place was incorporated as a borough in 1783, and as a city in 1847. It has the commission form of government. Daniel Boone was born near Reading. E.R.H.

READING, *red' ing*, RUFUS DANIEL ISAACS, first Marquis of (1860-1935), British statesman, lawyer, and financier. His long career was one of the most romantic of modern times. He was born in London, the son of a poor Jewish merchant. In 1874, he ran away to sea, and for the next two years saw the world from a small tramp steamer. Returning home, he entered the London University School, and later attended school in Brussels and in Hanover. He showed an early aptitude for finance, and at twenty-one became a stockbroker on the London Exchange. In 1887 he

had qualified and was admitted to the bar.

By 1904 he had attained a national reputation. He was elected a Liberal member of the House of Commons from Reading. He served there until 1913, when he entered the House of Lords. His political rise was very rapid, and few men have served their country in more ways. In 1910 he was made Attorney-General, and in 1912 entered the Cabinet, the first Attorney-General to do so. In 1913 Reading became Lord Chief Justice; he was the first Jew to hold this position.

As Lord Chief Justice, perhaps the most difficult trial at which he had to preside was the Roger Casement trial for treason in 1916. The report of this trial shows his ability, in a time of excitement, to remain calm and judicial.

In 1915 when the Allies needed funds to carry on the World War, Lord Reading was released from his legal duties to go to the United States to procure a war loan. He returned to the United States in 1917 as special envoy, and in 1918 succeeded Spring-Rice as high commissioner and special ambassador.

From 1921 until 1926, he was Viceroy and Governor-General of India. He found India in the midst of a social, religious, and financial crisis. When he left in 1926, he had given it a new workable financial system, put the railroads on a paying basis, set up a permanent tariff board, and quieted the general agitation.

For his various services to his country Lord Reading was given many honors. He was made a baron in 1913, a viscount in 1916, an earl in 1917, and a marquis in 1926. A.M.F.

READING FROM HOMER, the title of a famous painting. See page 3211.

REAGAN, *re' gan*, JOHN HENNINGER (1818-1905), an American political leader. He was born in Sevier County, Tenn., but after his twenty-first year, became a citizen of Texas, where he took up the profession of law. He was elected to the Texas legislature, and in 1852 became district judge. He then served from 1857 to 1861 in Congress, resigning to become Postmaster-General in the Confederate Cabinet of President Jefferson Davis.

With Davis, Reagan was captured by Federal troops, and was imprisoned for five months. The result of the war was accepted as final by him, and his views were expressed in a public letter, written from prison, in which he advised Texas to grant suffrage and other civil rights to the Negro, thus forestalling the radical legislation which he saw was certain to come from Congress. This advice was not well received, but, having soon reestablished his popularity, he served in the United States House of Representatives from 1875 to 1887, and in the Senate from 1887 to 1891. He then resigned to become chairman of the Texas State Railroad Commission. In the House,

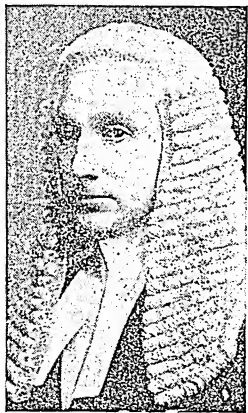


Photo: Brown Bros.

LORD READING
Lord Chief Justice of
England.



CUTTING GRAIN WITH SCYTHES

By keeping steadily at work, three men by this old method could cut about six acres in a day.

where Reagan was for a decade the chairman of the Committee on Commerce, he was foremost as an advocate of Federal regulation of railways. His name, perhaps more than that of any other man, will always be associated with the government policy which was adopted in the Interstate Commerce Act of 1887. See CONFEDERATE STATES OF AMERICA; INTER-STATE COMMERCE ACT.

REAGENTS, substances used in chemistry to determine the nature or composition of another substance by means of their mutual chemical action. The term has been loosely applied to any chemical agent. See CHEMISTRY.

REAL ESTATE, OR REAL PROPERTY. Land and the buildings upon it, trees, and any minerals, such as coal, iron, or stone, beneath the surface, are *real property*. In other words, real estate, or real property, consists of land and all permanent possessions naturally pertaining to it, in contradistinction to *chattels*, or personal property. The owner has a permanent right in real property, and at his death, it descends to his lawful heirs. But if, after an owner's death, the sale of his personal property does not bring in a sum sufficient to pay the indebtedness of the estate, the administrator is required to sell sufficient real estate to make up the deficiency, before the rights of heirs are considered.

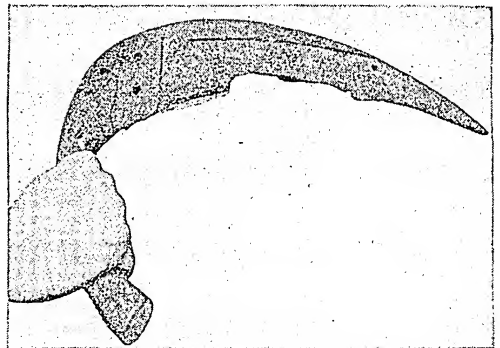
Real estate cannot be conveyed except by written contract. English law recognizes railway stocks or bonds as real property, but in the United States they are classified as personal property. The term *real property* came into use from the fact that, in case of contest over the title, the rightful owner received the *real* (actual) property and not a money equivalent.

Related Subjects. The following articles in these volumes should be read in connection with this topic:

Abstract	Lien
Deed	Mortgage
Husband and Wife	Personal Property
Joint-Tenancy	Torrens System

REALSCHULE, *ra ahl' shoo leh*, a type of German secondary school. See GERMANY (Social Conditions: Education).

REAPING MACHINE. Over 55,000,000 acres of farm land in the United States and much of the prairie provinces of Canada are



AN ANCIENT SICKLE

It was made of wood, with a knife of sharp stone, and was used in Egypt about 2000 B.C.

devoted to the raising of wheat. Were all this land placed together, it would form a vast wheat field, much larger than the combined areas of Illinois, Indiana, Iowa, and Missouri. With the old hand sickle, a good reaper could reap an acre a day. There are about 7,120,000 farmers in the United States and Canada; if one-fourth of them could de-

vote their time to harvesting the wheat crop by the sickle method, it would require forty days to complete the harvest; before the expiration of one-half that time, however, a part of the crop would not be worth harvesting. Therefore, under primitive conditions, large crops would be impossible. The present crops of the United States and of Canada and other wheat-growing countries have been made possible by the reaping machine, invented by Cyrus H. McCormick in 1831 (see MCCORMICK, CYRUS H.).

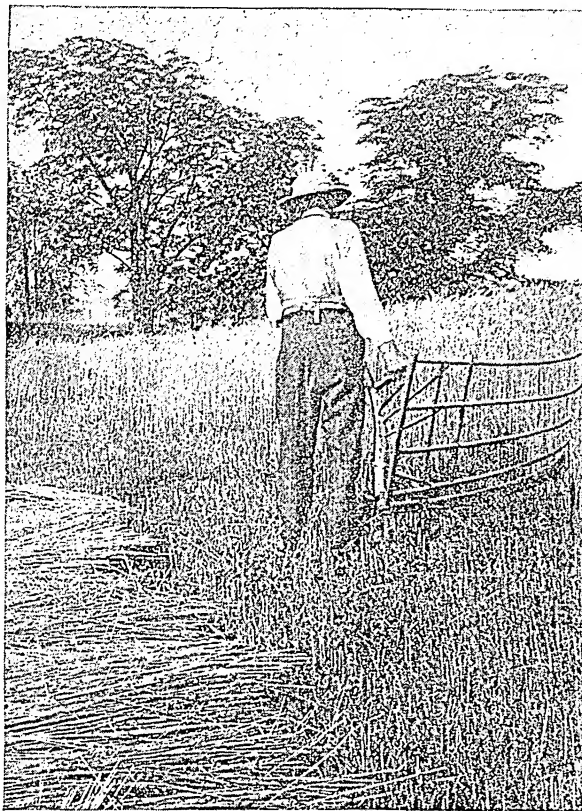
The First Reaper. This was a crude machine, but it revolutionized the practice of grain-growing. It was supported on two wheels, one being the main wheel, to which the gearing was attached. This wheel was of cast iron, and had projections on its outer rim to keep it from slipping.

The cutting part consisted of a horizontal steel plate called the cutter bar, which was six feet long, about five inches wide, and half an inch thick. To this bar, long steel points called guards were riveted. The cutting was done by triangular knives attached to a steel bar which slid forward and backward in a groove in the guards. A rapid motion was imparted to the knife bar by a crank operated by the gearing attached to the bull wheel. A divider separated the grain that was to be cut from that left standing, and a reel bent the grain back against the knives, picking up the stalks that were bent or lodged, so that all the grain was cut. As the grain was cut, it was laid on a platform, from which it was raked into gavels by a man following the machine. These were the essential parts of the first successful reaper. See illustration, page 98.

The Modern Harvester. The modern harvester, or *self-binder*, has been developed from

the original reaper. The first improvement consisted of a self-raking device which raked the grain from the platform and dispensed

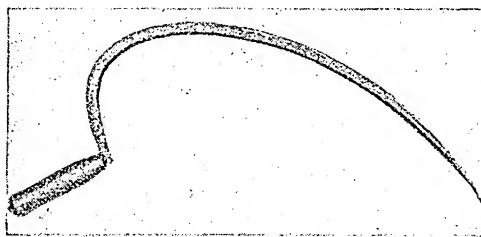
with the labor of the extra man. Following this improvement came the canvas belt which carries the grain over the main wheel to a box. From this box it is taken and bound by men riding on a platform attached to the machine. Then came the knotting device, an ingenious piece of machinery which enables the harvester to bind as well as cut the grain. In the self-binder, the canvas belt carries the grain to the binder head, where it is packed until there is enough for a bundle. Then a catch sets the knotting apparatus in motion, and the bundle is firmly bound with twine, thrown from the head by revolving arms, and loaded upon a platform or the ground, according to the plan of the machine. An ordinary harvester requires three or four horses to operate it successfully, and it will harvest ten



THE CRADLE, AN IMPROVEMENT UPON THE SCYTHE

A strong man could cut about two acres of grain in a day with a cradle. The cradle laid the grain in rows, and a man following him raked it into piles and bound it into sheaves.

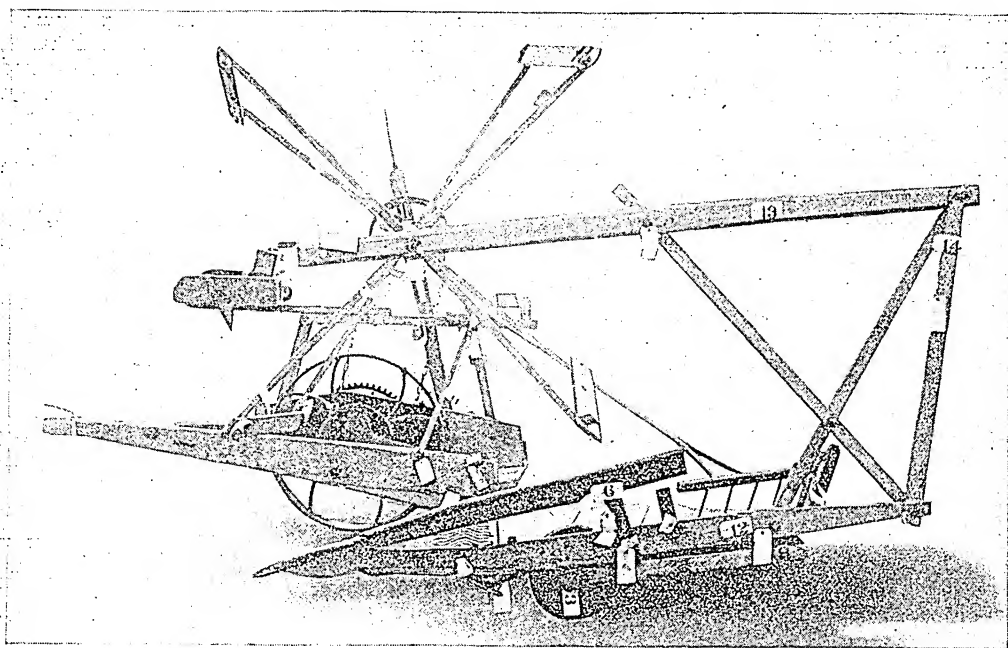
according to the plan of the machine. An ordinary harvester requires three or four horses to operate it successfully, and it will harvest ten



AN OLD SICKLE

The sickle reproduced above was made from a sword carried in the Revolutionary War. It cut many grain crops on a Pennsylvania farm.

to fifteen acres of grain a day. It can be used with equal success in harvesting wheat, oats, barley, and rye. On some of the largest farms,



THE MCCORMICK REAPER OF 1851

The identical machine of which the above is a photographed reproduction cut twenty-four harvests. It now reposes in a museum in the works of a manufacturing company. The numbers shown were on tags designed to identify the parts for assembling in the museum. The above machine was a slight improvement upon that of 1847, shown on the opposite page.

traction engines are used for operating the machines, one engine hauling several machines.

The *header* is a modified form of harvester, used in regions where the grain is well dried before harvesting. It cuts the grain just below the heads, which are carried by an elevator to a storage box on the machine, or to a wagon drawn beside it. The heads are stacked until dry enough to thrash. Headers are used to some extent where dry weather precedes the harvest.

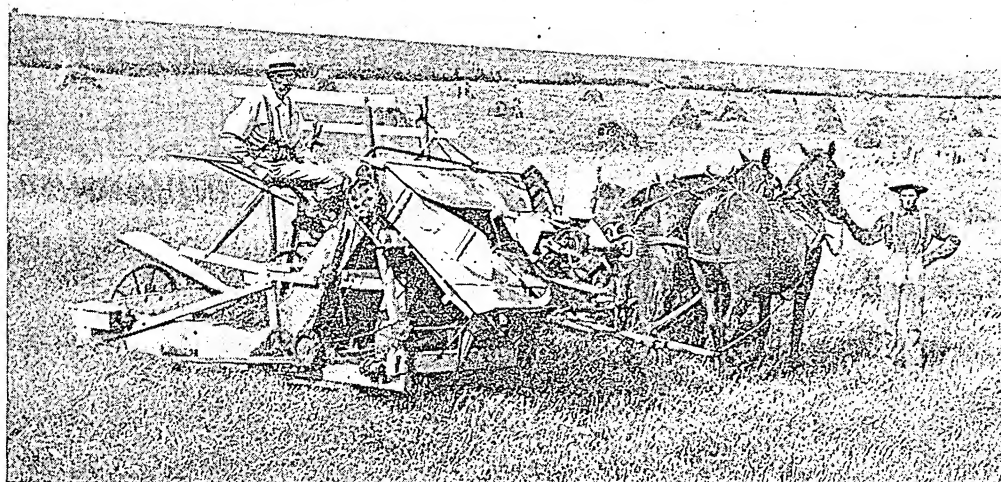
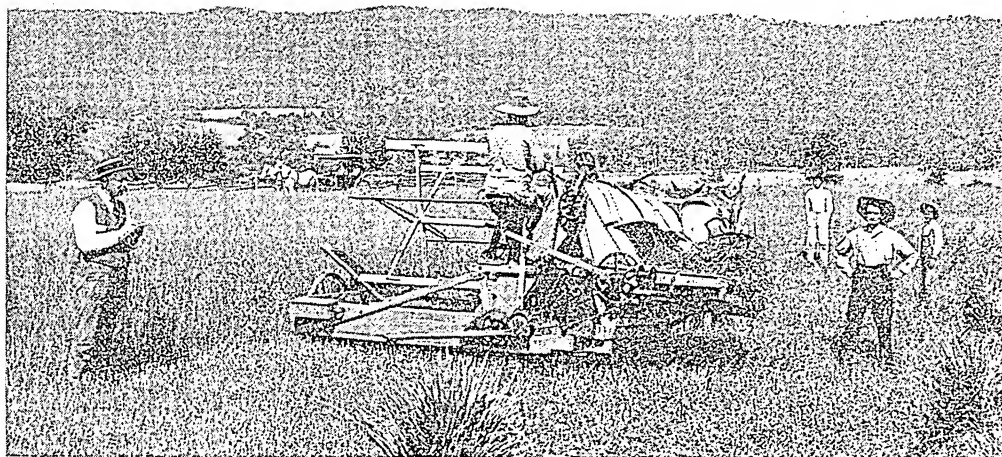
The Combined Harvester Thrasher (or COMBINE, as it is commonly called) is a machine that cuts and thrashes the grain, all at one operation. It has a cutting mechanism quite similar to that used on a self-binder. This mechanism is attached to the side of a small portable thrashing machine, and a wide, endless canvas belt carries the unthrashed grain from the cutting mechanism directly to the thrashing cylinder of the combine.

The thrashing mechanism is of the usual type, with some slight modifications to adapt it to do good work when traveling over irregular ground. The thrashed straw is usually dropped from the rear of the machine, and the grain is either discharged directly into a wagon which is drawn alongside of the machine, or else it is collected in a large bin mounted on the combine, and dumped into a wagon when this is filled. In some localities,

the grain is run directly into bags, which are sewed up and then dropped in groups of four or five over the field, to be collected later with wagons.

The first United States patent on record for such a machine is dated August 8, 1828. However, it was not until just after 1880 that the machine came into very practical use. It was first used on the Pacific coast, where the grain could readily be allowed to stand until it was dead ripe and thoroughly dry. The grain could then be immediately stored with safety. The first machines were very crude and heavy, and required an enormous amount of power to draw them over the ground and to operate them. In fact, it was not until the modern compact and dependable internal-combustion engine was developed that the combines made any great progress.

The general use and spread of the combine into other territory was slow until about 1917. Since that date it has spread with unprecedented rapidity throughout the Great Plains area, and also into the humid region of the United States, so that, at the present time, at least a few combines will be found in almost every grain-growing state. The rapidity of the spread of this machine may be realized from the statements that the first combine was used in Illinois in October, 1924, and that, the next year, there were twelve combines in the state;



The Advance in Reaper Building. At top, the reaper of 1847, the machine which followed a predecessor patented in 1834. [The 1834 machine is shown on page 98.] In center, the wire binder of 1877. Below, the twine binder of 1881.

6017

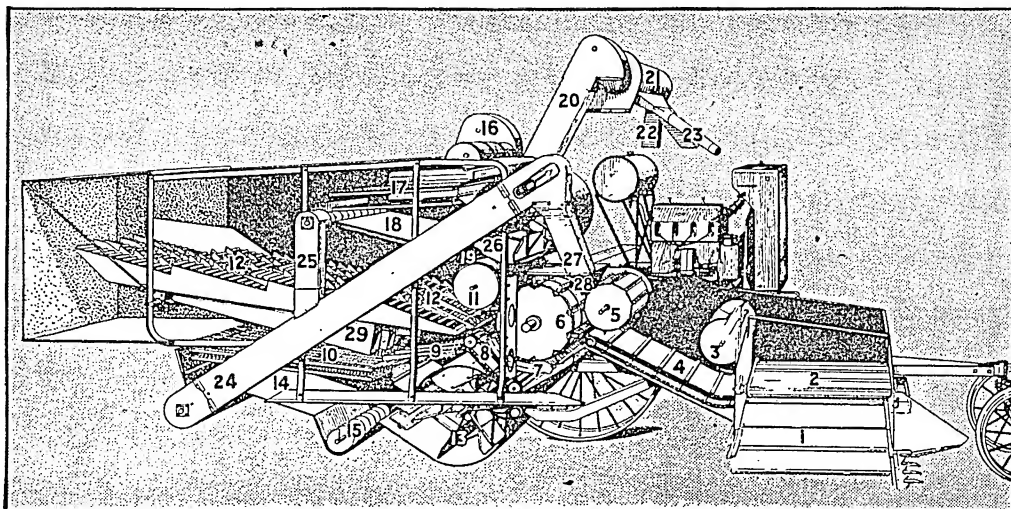


Photo: International Harvester Co.

PARTS OF A HARVESTER-THRASHER

After the grain is cut, it falls upon the platform canvas 1 and is carried up between the elevator canvases 1 and 2, and delivered upon the carrier 4. Beaters 3 and 5 help to carry the grain to the cylinder 6. The grain passes between the cylinder 6 and the concave 7, where 90 per cent of the separation takes place, and the grain is carried by the conveyor 8 to the grain pan 9. The grain flows across the grain pan 9 as the pan is vibrated until it reaches the shoe 10, where a blast of air from the fan 13 carries away the chaff and the grain falls through the sieves 10 upon the pan 14, and runs down into the auger 15.

Thrashed grain is carried by the auger 15 into the lower end of the elevator 16, and elevated to the recleaner 17. Here it receives a blast of air from the fan 26. The clean grain falls through the sieves of the recleaner and runs down over the pan 18 to the auger 19, which carries it out into the elevator 20, and it is delivered to the revolving weed screen 21. Here the weed seeds are eliminated and the clean grain is delivered at divided spout 22, and the weed seeds at spout 23.

Tailings passing over shoe 10 are returned by elevator 24 to spout 27, and thence to the cylinder 6 for re-threshing. They are spread out and delivered in front of the cylinder by means of a deflector 28. Tailings passing over the recleaner sieve are carried by the auger into elevator 25, where they join the tailings from the shoe and are returned to the cylinder. As the straw comes from the cylinder 6, beater 11 retards it and throws it down upon the straw rack 12. The four-section straw rack tosses and tears the straw apart, shaking out every particle of grain into the troughs 29 underneath each rack section. The grain flows down these troughs to the forward end of the shoe 10. The straw passes out at the rear onto the ground.

the year following, sixty-four; and the year following that, 300. The machine is especially advantageous where the straw need not be saved. If the straw is to be saved, it is necessary to load it up in wagons and haul it to the barn after the grain is harvested.

The combine marks almost as great an advantage over the self-binder as the self-binder did over the cradle and the flail. It is not uncommon for a family of three or four to harvest 400 or 500 acres of grain a year with a combine and a tractor. Some predict that the combine eventually will replace the self-binder, but in order to do this, it would appear that some modifications of the present machine will be necessary, and the established customs of the farmers in the humid sections will have to be changed somewhat. Even so, it is likely that considerable grain will always be cut with the self-binder in the rougher sections and small farming sections of the humid area of the United States.

Summary. Probably no other invention has contributed so much toward increasing the food supply of the race as the reaping machine.

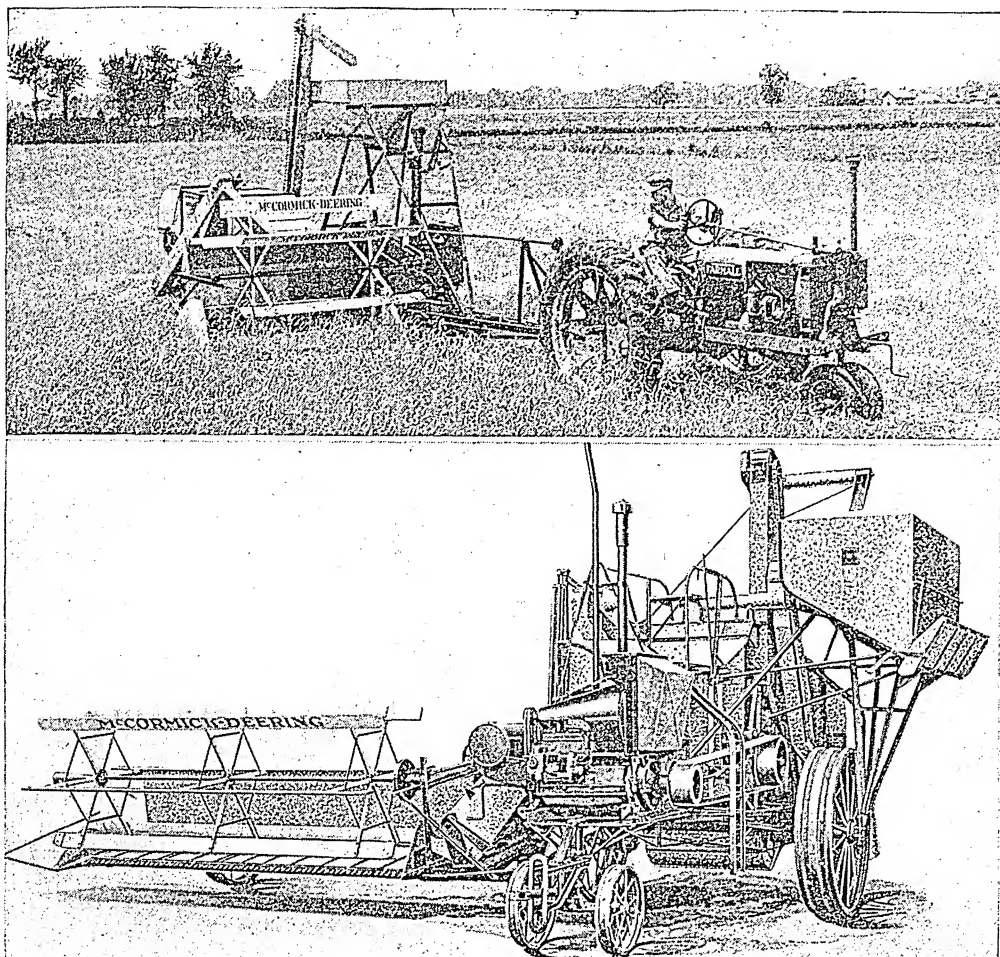
The largest manufactories of these machines are in and about Chicago. Harvesters are now found in every wheat-growing country; it is estimated that over 2,000,000 of them are in operation in the world. Somewhere on the fertile earth the whir of the harvester may be heard every day in the year. F.W.D.

REAR ADMIRAL. See ADMIRAL.

REASON, OR REASONING. Reasoning is sometimes called the third, or final, step in thinking. It consists in comparing two judgments or propositions and forming a conclusion as to their agreement or disagreement. In formal reasoning, the general proposition is called the *major premise*; the special proposition, the *minor premise*. The *conclusion* is made on the ground of the major premise. These premises and the conclusion form the *syllogism*, which may be stated as follows:

All wood floats.
This object is a piece of wood.
Therefore, this object will float.

Ordinarily, the general proposition is not stated, because a knowledge of it is taken for



MODERN REAPERS

Above, a six-foot harvester-thresher, drawn by a tractor. Below, a three-quarter front view of a similar machine—which cuts a swath of twelve feet.

granted. We say that this piece of wood will float, because it is generally known that all wood floats. The validity of the conclusion rests upon the validity of the general proposition and the care with which the comparison has been made. The validity of the conclusion in the example given is beyond question, because the truth of the general proposition has been established for centuries, and the object in hand was wood; but had the object been iron, painted to resemble wood, the conclusion would not have been valid. Many false conclusions are drawn because of hasty and careless observation. Such hasty conclusions are what we commonly call *snap judgments*. The reasoning that this black bird is a crow, since all crows are black, is false.

In the process of reasoning, one judgment logically leads to another. We arrive at our

conclusion *because* of the relation of the propositions compared. The general proposition is a truth which has been established through long and extensive observation, not simply of one individual, but of many, and is based upon all the facts learned through these observations. Sometimes further observation leads to the discovery of new facts which modify the general proposition. Then all conclusions based upon it must also be modified.

General propositions are formed by *inductive* reasoning, and conclusions are arrived at through *deductive* reasoning. These processes are explained under *INDUCTIVE METHOD* and *DEDUCTIVE METHOD*.

Cause and Effect. The person with a well-trained mind has his knowledge so classified that he reasons from cause to effect. When a washerwoman says, "It is going to rain; I must

take my wash in," she is acting from what she has learned through past experiences. This process of reasoning, however, is the same as was that attributed to Newton, when, from observing the fall of the apple, he reached the conclusion that all the heavenly bodies attract each other. The difference in the problems is in the vastness of their application. We also reason from effect to cause. When we find pools of water in the road in the morning, we infer that it rained during the night, because we know that rain causes such an effect. In both cases, the same relation of proposition is maintained.

Independent Thinking. A great majority of people accept without question the conclusions of others, instead of thinking out their own problems and arriving at their own conclusions. Pupils in school rely upon the teacher and upon their classmates for the solution of problems in mathematics, the analysis of sentences in grammar, and for any other help they can get. The result of so much assistance is that, when they leave school, these young people are sadly lacking in that mental vigor that they need in solving the problems of life. Parents and teachers should train the children under their charge to do independent thinking and logical reasoning.

C.E.S.

Related Subjects. The reader is referred to the following articles in these volumes:

Deductive Method
Inductive Method

Judgment
Thought

REASON, AGE OF. See AGE (Historic Ages).

REAUMUR SCALE. See THERMOMETER.

REBATE, in mercantile law, is the same as discount, such as deducting the interest for prompt payment, or giving a certain percentage off for cash, or offering a definite reduction to secure favors or good will.

Rebates to shippers by transportation companies is a common method by which these companies once discriminated between shippers. The practice is unlawful, and common carriers convicted of it are subject to heavy fines. A contract to procure rebates from railroads for the shipper is void, because unlawful, but this fact does not invalidate the contract for shipping, nor release the common carrier from liability on its bills of lading. See INTERSTATE COMMERCE ACT.

F.H.E.

REBECCA. See ISAAC.

REBEKAH, DAUGHTERS OF. See ODD FELLOWS; COLFAX, SCHUYLER.

REBELLION, *re bel' yun*, OF 1837, the attempt of the Radicals in Upper and Lower Canada to introduce by force of arms the principle of responsible government. In the quarter of a century following the War of 1812, many reforms had been secured in the Canadas, but responsible government was still withheld. The Radicals, or Reformers, had only

two courses open to them; either they could continue to exert a steady pressure by constitutional means, or they could resort to arms in rebellion. In the Maritime Provinces, the extremists among the Reformers were not influential, but in the two Canadas, the leaders of the reform cause were extremists who were brilliant and courageous, but lacking in a sense of proportion. William Lyon Mackenzie in Ontario and Louis J. Papineau in Quebec are unique figures in history. Both were disappointed in their efforts to gain their ends by peaceful means, and both chose open rebellion.

In Lower Canada. In Quebec, or Lower Canada, as it was then called, there was almost from the beginning of British rule a party of discontent. After the War of 1812, this faction increased rapidly in influence, and for two decades there was almost constant friction between the legislative assembly on the one hand and the lieutenant governor and the legislative council on the other hand. In the assembly, the discontented French element had a large representation. The lieutenant governor and his council were British. Into this conflict of race were interjected other issues, notably the question of maintaining the French language and the Roman Catholic religion. Later, the assembly demanded full control of the purse strings, and when other methods failed, simply declined to appropriate funds. Lastly, there came a demand for an elective legislative council.

In 1835 Lord Gosford was sent out to Quebec as Governor-General, with instructions from the king that the establishment of an elective legislative council would never receive the consent of the Crown. This monarchical attitude of William IV as expressed in the government of Lower Canada provoked rebellion. Public meetings of protest were held, the "Sons of Liberty" were organized, and the rebels began to muster at Saint Charles and Saint Denis. The rebels met a strong hand. The rebel army at Saint Charles was routed in a battle of no consequence, and the news of this defeat was enough to scatter the forces at Saint Denis. Smaller groups of the rebels made a hopeless stand in several villages north of Montreal, but the rebellion was over, practically, at the first blow. Almost at the beginning of the disturbance, Papineau fled to the United States.

In Upper Canada. In Upper Canada, events followed a similar course. Mackenzie, breaking with Baldwin and the moderate Reformers, issued a proclamation setting forth the grievances of the people and renouncing allegiance to Great Britain. He called on the people to rise, the plan being to capture the military stores in the Toronto city hall. Four hundred rebels met a slightly larger force of militiamen, were routed after a skirmish, and the plan failed.

Mackenzie with some of his followers fled to an island in the Niagara River just across the United States border. There they established a "provisional government." The "Patriots," as they called themselves, received their supplies by the steamer *Caroline*. One night a band of Canadians, under instructions from Colonel Allan Macnab, rowed out to the *Caroline*, set it on fire, turned it adrift, and sent it over Niagara Falls. Mackenzie soon afterward gave up the pretense of rebellion.

Results of the Rebellion. From a military point of view, the rebellion was not worthy the name. The rebels in the two provinces acted in co-operation, but not closely enough to constitute a serious menace. The rebellion failed because Papineau and Mackenzie misjudged the feelings of the majority of the people. The rebels were representative neither of the French-Canadians nor of the Reformers. The rising gave reform a temporary setback, yet it had at least one important and favorable result. It caused the British government to send the Earl of Durham to Canada. Durham issued a report which is perhaps the most remarkable document in the history of Canada. Its result was the Act of Union of 1840, uniting Upper and Lower Canada.

Related Subjects. The reader is referred to:

Durham, Earl of Papineau, Louis J.
Mackenzie, William Lyon Union, Act of

RECALL, THE, is a political device whereby the voters may remove a public official before the expiration of his term of office and replace him by another. The removal and replacement is accomplished by a special election. In colonial days, New England towns claimed the right to recall their deputies in the provincial legislatures. The modern use of recall in the United States dates from the charter of Los Angeles in 1903. Seattle followed in 1906. As a reform measure, the recall took a prominent place in the Progressive Party movement (see **PROGRESSIVE PARTY**) that culminated in the campaign of Theodore Roosevelt for the presidency in 1912.

The recall has been adopted by several hundred cities and by twelve states. The latter include Oregon (1908); California (1911); Colorado, Washington, Idaho, Nevada, and Arizona (1912); Michigan (1913); Louisiana and Kansas (1914); North Dakota (1920); and Wisconsin (1926). In only eight of these states does the recall apply to judges. To recall an official requires a special election. This is called after the filing of a petition bearing the signatures of a certain percentage (usually, 25 per cent) of the total number of electors who voted in the last election for this particular office. Candidates for the office in question may file by petition. The special election then becomes a contest between the incumbent (the accused officer) and the new candidates.

If the incumbent secures the largest number of votes he retains office, and is usually considered as vindicated. If one of his opponents polls a larger vote, the incumbent is automatically removed from office and the winning candidate serves the unexpired portion of the term of office. On numerous occasions mayors of cities have been recalled, but only once a governor of a state. That was in North Dakota in 1921.

Advocates of the recall hold that the voters should have a direct means of removing an officer whose conduct justifies belief that he is dishonest, incompetent, or heedless of public opinion. Almost all state constitutions provide for the removal of executive officers by a judicial process called impeachment (see **IMPEACHMENT**). But, it is argued, impeachment is too cumbersome, and there is an advantage in letting the people have a direct means of holding an officer to account. Opponents of recall declare that like direct legislation, as the *initiative* and *referendum* (see **INITIATIVE AND REFERENDUM**), the recall tends to shift responsibility. It is a weapon which may be turned to wrongful use. If too frequently employed, it will deter the best men and women from officeholding.

The recall is found in European constitutions, particularly those of Soviet Russia in 1918 and of Germany in 1919. In Europe, however, these provisions are not generally used. K.C.

RECAMIER, MADAME JULIE (1777-1849), a Frenchwoman famed for her beauty and mental attainments. She maintained a salon and entertained the great men of her day and thus became a power in politics. Napoleon heartily disliked her because she violently opposed him, and he caused her to be exiled from France. After his downfall, she returned to Paris.

RECEIPT, re seel'. George Evans, a retail grocer of Muncie, Ind., sold goods to Charles Miller, on account, with the understanding that Miller should pay his account the first of every month. On Oct. 1, 1930, Miller's account amounted to \$15.75, which he paid in cash, and for which Evans gave him the following acknowledgment:

\$15.75 Muncie, Ind., Oct. 1, 1930.

Received of Charles Miller

Fifteen.....and 75/100 dollars

In full of account to date.

GEORGE EVANS.

We learn from the foregoing statements that a *receipt* is a written acknowledgement of the payment of money. It is also a written acknowledgment of receiving any property named in the receipt. Receipts are of three kinds: *receipts in full*, like the one above; *receipts on account*, given when only a portion of the amount due is paid; and *receipts to apply on special accounts*. A receipt should always show whether payment is made in full, on ac-

count, or on the special account to which the payment is applied, when there is more than one account between the parties. A receipt should be given whenever an account is paid. A bill marked *paid* and properly signed constitutes a receipt. A receipt is not absolutely conclusive; it may legally be attacked, in case error can be shown.

Many business concerns will not send the customer a receipt unless specifically requested, if the payment is by check, for the canceled check is considered evidence of the payment.

F.H.E.

RECEIVER, one who is appointed by a court to have custody, management, or disposal of property under litigation, or of property in litigation owned by an incompetent person. The conditions most frequently leading to a receivership are these:

1. Incompetency, that is, cases in which property is held by a person under legal age to act for himself, and cases of insanity. When there is no legal guardian, a conservator may be appointed.
2. Disagreement among partners. When the disagreement reaches a stage that makes it impracticable to continue the business under the existing management, a receiver is usually appointed to manage the business or to close it out.
3. Insolvency, either of a firm or of a corporation.

A receiver is appointed when one party to a controversy applies to a court having jurisdiction in the case, or as the result of a petition by creditors. The applicant must prove the reasonableness of his petition. A hearing is then appointed, at which the defendant is given opportunity to show why the petition should not be granted. If the petitioner is sustained, the receiver is appointed. The receiver is an officer of the court, and is limited in his authority and acts by the decree appointing him, and by the laws of the state governing receiverships. He is a disinterested party, and is required to administer the business committed to his charge in the interest of all parties related to it. Under receiverships, where there is danger of insolvency, profits must first be applied to the payment of indebtedness.

The receiver cannot bring suit without consent of the court. Nor can any other court of concurrent jurisdiction bring suit against him without consent of the court by which he was appointed. Suit, however, may be brought through a superior court. A receivership terminates when the work of the receiver is completed; he is then formally discharged by the court. The receiver is entitled to compensation for his services, and his claims, together with the necessary expenses of the receivership, constitute a first lien on the property. Before assuming his duties, he is required to file a bond in such amount as may be fixed by the court.

RECEIVER. See **RADIO COMMUNICATION.**

RECENT EPOCH. See **HUMAN EPOCH.**

RECHABITES, members of a society of alcoholic abstainers founded in England, 1835.

RECIFE, *ray se' fay*, the local name of the Brazilian city of Pernambuco. See **BRAZIL** (The Cities).

RECIPROCITY, *res ih pros' ih tie*, in a broad sense, means exacting and giving equivalent treatment, but as used in connection with tariff legislation, the word has acquired a special meaning. It refers to the policy of advancing international trade by means of treaties which grant mutual trade concessions. A reciprocity proposal is to this effect: "The tariffs of our country are as printed; however, if on certain of your products you will lower your tariff rates for us, we will make corresponding reductions in certain of our schedules for you. We have goods you must purchase, and you have things that we require; why not arrange favorable terms for both of us on our tariffs?" Reciprocity treaties are therefore in effect among many nations. See **TARIFF**.

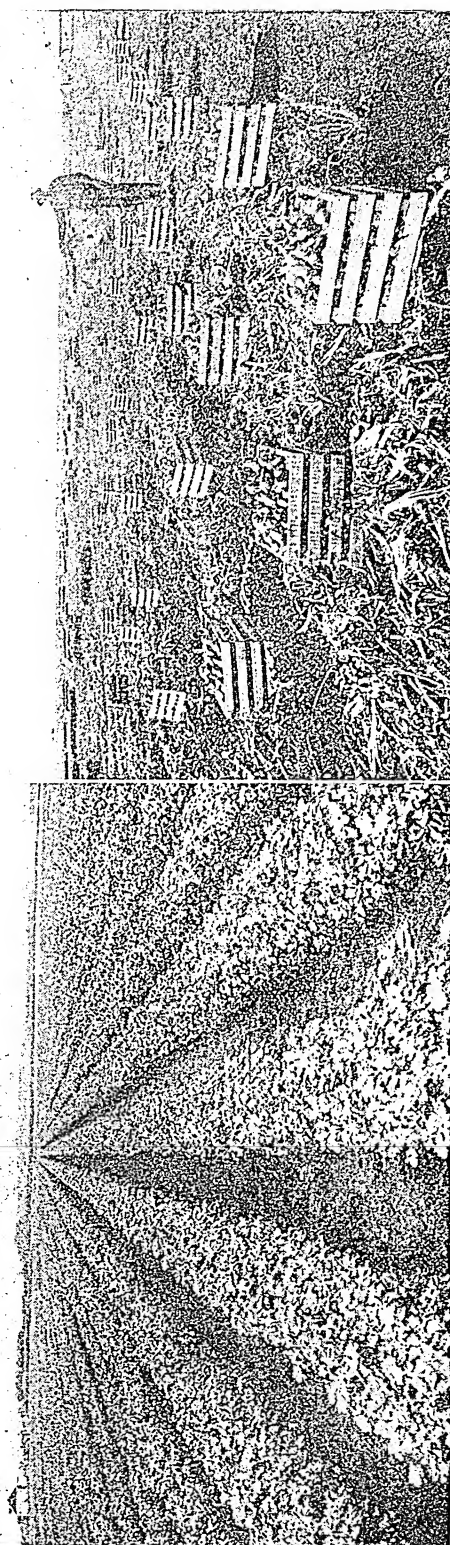
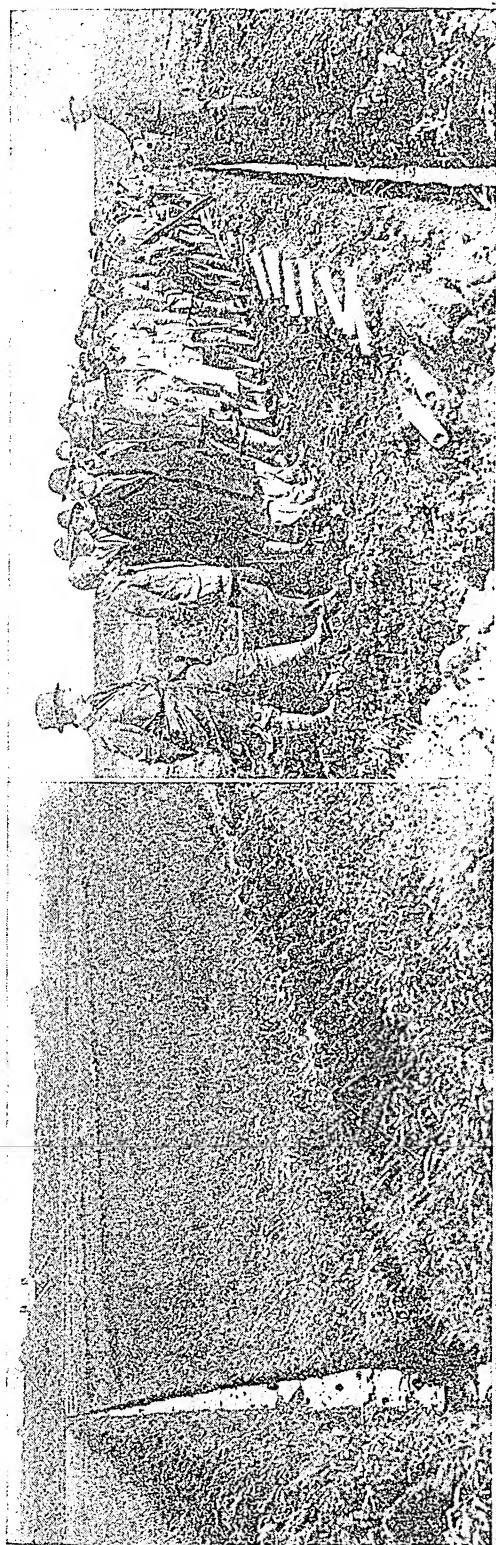
RECLAMATION ACT. See **LANDS, PUBLIC; IRRIGATION.**

RECLAMATION is the process of improving lands having little or no value in their original condition, in order to make them usable, generally for agricultural purposes. The term has particular application to work which because of its magnitude or nature cannot be performed by the individual but requires a community effort or government assistance. There are two recognized types of reclamation: the reclamation of arid lands by irrigation; and the reclamation of swamps or flooded lands by drainage or filling. The removal of stumps from cutover forest lands is also sometimes classed as reclamation.

How Land is Reclaimed. Irrigation involves the construction of canals and ditches to the land from the source of the water supply, usually a stream; and, in most cases, the construction of reservoirs to store water during the nonirrigation and high water seasons, for use during the low water part of the irrigation season. Swampland reclamation is usually accomplished by digging drainage canals in which the surplus water is collected and conveyed to a place of disposal. Frequently the swampland is higher than adjacent territory into which the water will flow by gravity through the drainage canals.

Other lands are lower than the surrounding water level, in which case dikes are necessary to keep the land from being flooded, and the drain water must be pumped out of the canals. The vast area in Holland from which the sea has been driven back is a classic example of this type of reclamation.

In some cases, low lands are earth-filled to raise the surface above the surrounding water



Photos: U & U

Reclamation Adds to the World's Food Supply. At top, left, swamp in Germany drained by ditch systems connected with suction pumps; at right, a teacher instructing farmers in the art of swamp drainage. Below, at left, a celery farm in Michigan reclaimed from a swamp; at right, an onion held in Minnesota which was once almost an impassable swamp.

level. This method is frequently used in reclaiming water-front property for industrial use.

In the United States. Most of the important reclamation in the United States has been the irrigation type. A number of areas of swamp-land have been reclaimed, but these projects are mainly local in character. The Federal program under the Bureau of Reclamation in the Department of the Interior has been confined to irrigation projects in the western states. During the thirty-eight years of the Bureau's existence from 1902 to 1940 it has constructed works to irrigate approximately 2,500,000 acres of previously unproductive land and, in addition, has provided a supplemental water supply for some 1,500,000 acres. The program now underway will add another 2,500,000 acres of new land, and supplement the inadequate water supply for 3,500,000 acres. It is estimated that about 20,000,000 additional acres could be irrigated. There is also in the country an immense acreage of swamp-land which could be reclaimed if sufficient public assistance were made available.

See also CONSERVATION; DAM.

Foreign Reclamation. Extensive irrigation works have been constructed in Egypt, India, Canada, Australia, and New Zealand. A number of the South American countries have land under irrigation, and Mexico is carrying out a comprehensive program of providing farm homes through the irrigation of arid lands. In Europe, in addition to Holland, Belgium and Italy are among the countries in which reclamation by drainage is of importance. Belgium has reclaimed a large area of marsh and shallow lake lands and the drainage of the Pontine marshes in Italy, between Rome and Naples, has made available rich agricultural land capable of supporting thousands who might otherwise be in need.

Related Subjects. The reader is referred to the following articles:

Alberta	Egypt
Arid Region	Everglades
Belgium	Irrigation (with list)
Canada	Saskatchewan
Drainage	Zuider Zee

RECOGNITION. See MEMORY.

RECONSTRUCTION, *re kon struk' shun*, the process by which the states forming the American Confederacy regained the status they enjoyed before the War of Secession. The process of reconstruction was begun by Lincoln, whose theory was that the rebellion in each state was organized by an element within the state, and that none of the states had really left the Union. Normal relations, therefore, could be restored as soon as the loyal elements assumed control of the various governments. But, because of Lincoln's untimely death, the matter remained for solution by President

Johnson, under whose tactless efforts serious friction arose between Congress and himself, ending in his impeachment.

Johnson's first efforts met with partial success, owing to a Congressional recess. Military governors were appointed in the Southern states, conventions were held which repealed the ordinances of secession and framed new state constitutions, and legislatures were chosen which, except in the case of Mississippi, ratified the Thirteenth Amendment, abolishing slavery.

When Congress met in December, 1865, it proposed a series of legislative acts designed for the protection of the negroes. By the act of March 2, 1867, the South was divided into five military districts, with a major general of the Union army in command of each. Protected by Federal troops, the negroes participated in framing legislation and controlling the government—a task for which they were ludicrously unprepared. The result, of course, was incredible waste and extravagance. Unscrupulous politicians from the North, called *carpetbaggers*, because it was supposed they could crowd all their worldly goods into the carpetbag valises they carried, organized the negro vote in their own interests. The result was negro domination, administrative chaos, a great deal of insolence, and no little violence.

Grant continued to follow the Congressional policy during his term, but a saner attitude was soon adopted. All the states were restored to the Union by 1870, and an amnesty act, passed in May, 1872, pardoned practically everyone who had taken part in the War of Secession against the Union. When President Hayes removed the army from the states involved, the process of reconstruction was ended.

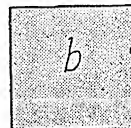
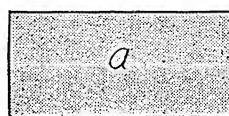
Related Subjects. The reader is referred in these volumes to the following articles:

Carpetbaggers	Johnson, Andrew
Confederate States	United States (History)
Hayes, Rutherford B.	War of Secession

RECONSTRUCTION FINANCE CORPORATION. See HOOVER, HERBERT CLARK; UNITED STATES (More Recent History); BANKS AND BANKING (Recent Developments).

RECREATION. See HEALTH HABITS; LIFE EXTENSION; AMUSEMENTS; SAFETY.

RECTANGLE, *rek' tan g'l*. A plane figure having four straight sides, whose opposite sides



RECTANGLES

(a) The form of the figure ordinarily called a rectangle; (b) is a square, but it is also a rectangle.

are parallel and therefore equal, and whose angles are right angles. is a *rectangle*. It is the

latter qualification which makes the term a more restricted one than *parallelogram* and which gives to the figure its name, for *rectangle* means literally *right-angle*. If the four sides of a rectangle are equal, the figure is a square, as shown in the accompanying illustration. See MENSURATION; QUADRILATERAL. J.W.V.

RECTIFIER. See RADIO COMMUNICATION (Glossary of Radio Terms).

RECTIFYING. See DISTILLED LIQUORS.

RECTILINEAR, *rek' tih lin' e ahr.* See PLANE; ANGLE.

RECTUM. See INTESTINE.

RED. Of the seven colors of the solar spectrum, red is the least capable of being refracted, and the one having the longest wave-lengths. According to the common theory of color, red is one of the three primaries, and green is its complement. Red is the color most easily seen. It is everywhere used for the stop-light signal in traffic regulations, and for the danger signal on railroads. In some large cities, the street cars are painted red that they may be seen easily at a distance.

Red is commonly used in dyeing and in the arts. Among the best-known red coloring matters are carmine, vermilion, red ochers, madders, and certain coal-tar products. Red

is also employed in the three- and four-color processes of reproducing colored pictures. In nature it is seen in various shades and hues in the bloom of such flowers as the rose, the poppy, and the geranium, in foliage, in various minerals, in soils, and in the plumage of many birds.

A.L.F.

As a Symbol. Red, being the color of blood, is the symbol of passion. "To see red" is to be very angry. The red flag is the standard of communists and of anarchists. Red occurs in the national flags of many nations. A red cross is the symbol of the world's greatest organization for work of mercy.

Related Subjects. The reader is referred in these volumes to the following articles:

Color	Light	Red Cross Societies
Flag	Printing	Spectrum Analysis

RED ADDER. See ADDER; COPPERHEAD.

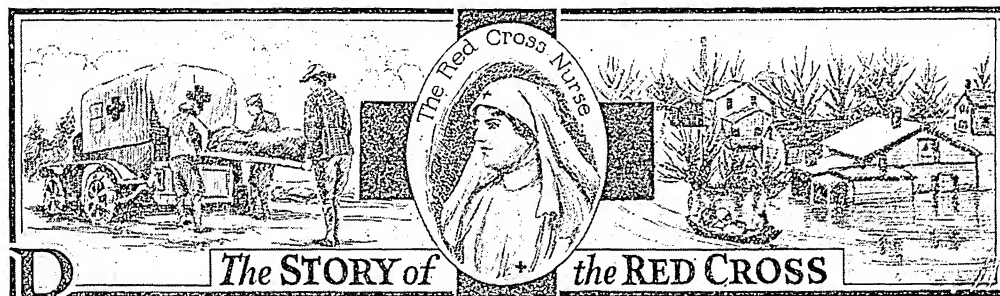
REDBEARD. See FREDERICK (I, Germany).

REDBIRD, the common name for all birds of red plumage. In the United States, cardinals and the scarlet tanager, and sometimes the European bullfinches, are called redbirds. See CARDINAL BIRD; TANAGER. D.L.

REDBREAST. See ROBIN.

RED CEDAR. See JUNIPER.

RED COMYN, a claimant to the throne of Scotland. See BRUCE, ROBERT.



RED CROSS SOCIETIES, now found throughout the world, stem from the spirit manifested in medieval times when friars and nuns pledged themselves to aid the sick, not infrequently extending their ministrations to the battlefields. Inheritor of the centuries-long struggle against human suffering in war and in peace, the Red Cross is the most gigantic undertaking man has ever conceived for this purpose.

The mission of the Red Cross, as it is commonly known, was originally to supplement with its trained physicians and nurses the work of the regular military organizations. Nations are not usually in a state of war, and not many years after the Red Cross was organized, it found opportunity to exercise its humanitarian impulses in relieving distress due to great calamities, such as earthquakes, great fires, famines, and floods.

The societies in different countries are not

officially connected, but they work in harmony through the International Red Cross Committee, which has its headquarters at Geneva, Switzerland. The various societies are identified, for example, as the *British Red Cross*, *German Red Cross*, *Italian Red Cross*, thus certifying to the national character of the organizations. The movement to prevent needless suffering in war has become so popular a part of the world's work that sixty-four powers have bound themselves by treaty to respect the Red Cross and preserve its absolute neutrality when in service. So the organization knows no nationality when on errands of mercy. Beginning especially with World War I, Red Cross nurses of each belligerent attended without discrimination, on the battlefield and in hospitals, the wounded of all warring nations. Generally speaking, belligerents have respected the Red Cross as a neutral link between them, and in both world wars approved the safe conduct of

"mercy ships," laden with food, clothing, and medical supplies.

The Red Cross Society of each nation is supported either by government appropriations or by voluntary contributions, or by both. A red cross, with wide arms of equal length, on a square, white background is the symbol of the organization throughout the world, with five exceptions; this speaks to all men in a universal language. Wherever that flag floats, wherever it is seen painted on ambulances, or where it is merely a square of cloth sewed to the left sleeve, it commands neutrality and respect; in actual warfare, gunners ordinarily direct their fire so that members of the Red Cross may not purposely be endangered.

Five nations which subscribe to the Treaties of Geneva, but do not use the red cross as a symbol are: Turkey, Egypt, Iraq, and some soviets of the U.S.S.R., which use the red crescent; and Iran (Persia) which employs the red lion and sun.

History and Development. During the Crimean War, (which see), Florence Nightingale discovered dreadful conditions in the British military hospital at Scutari, and acted to relieve the suffering of the wounded, thus becoming the founder of nursing, at least in its military aspects. When the War between the States was under way in 1861, a band of men and women, shocked as "The Angel of the Crimea" had been by the conditions of neglect in army hospitals, organized themselves as the United States Sanitary Commission to aid the sick and wounded. The Commission had no official standing, but President Lincoln gave it his approval, and it was able to do much to alleviate the lot of battle victims. Both these events foreshadowed the Red Cross.

In the meantime, the actual idea of Red Cross was germinating in Geneva. Henri Dunant, a Swiss citizen who started a tour of Italy in 1859, was caught in the swirl of events when Napoleon III attacked Austria to take Savoy for France. From a near-by hilltop he watched the bloody battle of Solferino, which left 40,000 dead and wounded strewn on the field. Shocked by their suffering and the absence of organized relief, Dunant obtained audience with the Emperor, persuaded him to release captured Austrian surgeons to tend the wounded, and organized kindly residents of the vicinity to aid the work of mercy.

Many of the wounded survived because of these ministrations, but Dunant never forgot the scenes of horror he had witnessed. Accordingly, in 1862, he published at Geneva a pamphlet, "Un Souvenir de Solferino," which ended with this plea: "Would it not be possible to found and organize in all civilized countries permanent societies of volunteers which in time of war would render succor to the wounded without distinction of nationality?"

Dunant's appeal won such response that on October 26, 1863, the representatives of fourteen governments and seven philanthropic groups met in Geneva to canvass means of bringing his idea to realization. This conference laid the groundwork for the Red Cross, and chose as insignia the reverse of the Swiss flag, a white cross on red background, in honor of the host nation.

The next step was to obtain official international agreement, by treaty, ratifying the general scope of the plan. Between August 8 and 22, 1863, at the invitation of the Swiss Federal Council, delegates from thirteen European nations and the United States met in Geneva and drafted the famous Articles of Convention, since known as the First Treaty of Geneva, or the International Red Cross Treaty, the basic structure of the Red Cross.

The American delegates did not have authority to sign, and ratification by this country was delayed for seventeen years; but in the meantime there was organized the American Association for the Relief of Misery on the Battlefields, which adopted the red cross as its emblem. This group functioned until 1871, when it disbanded because of the difficulty of operating under a treaty not yet ratified in America.

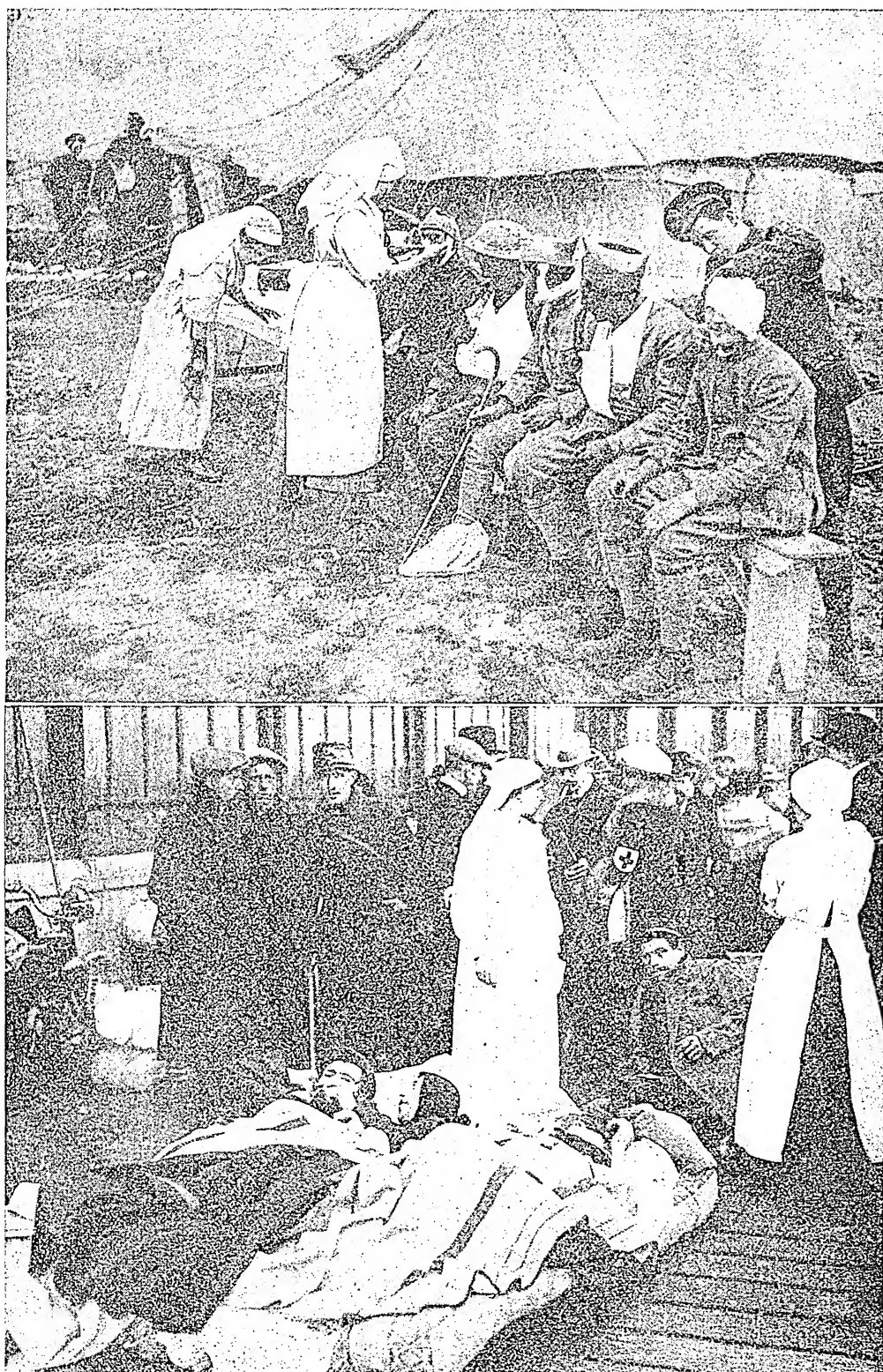
International Groups. At Geneva, in neutral Switzerland, are headquarters of two important Red Cross organizations, the International Red Cross Committee and the League of Red Cross Societies.

The Committee, consisting entirely of Swiss citizens, has four main functions: To see that the basic Red Cross principles are kept, and to extend recognition to new Red Cross societies; to see that all civilized states adhere to the Geneva Convention; to see that this international public law is observed, if necessary by means of legislation and military regulation by governments; to create international agencies in wartime for the relief of sufferers and prisoners of war, especially by providing information and means of communication between prisoners and their families, visiting prison camps, and the like. The Committee also acts as a voluntary medium between governments, or people giving help to victims of the conflict.

The League, formed of five nations in 1919, now comprises more than sixty. After World War II began, the League moved its headquarters from Paris to Geneva, to preserve its neutral character and to co-operate with the International Committee.

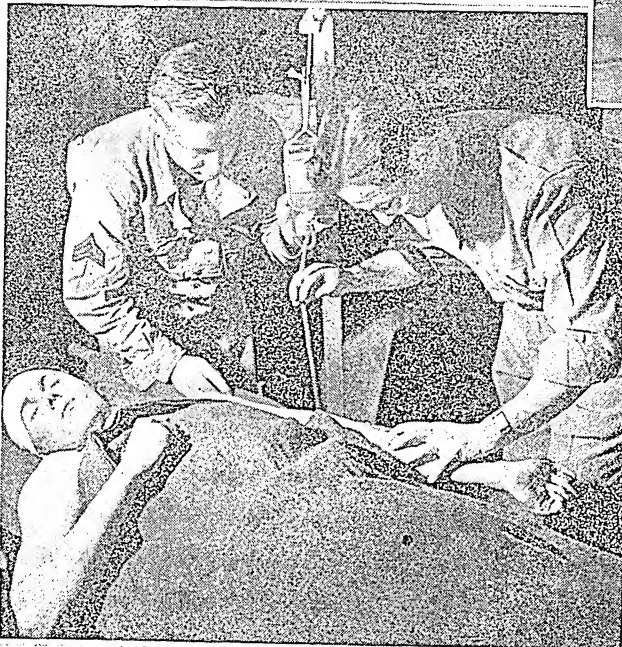
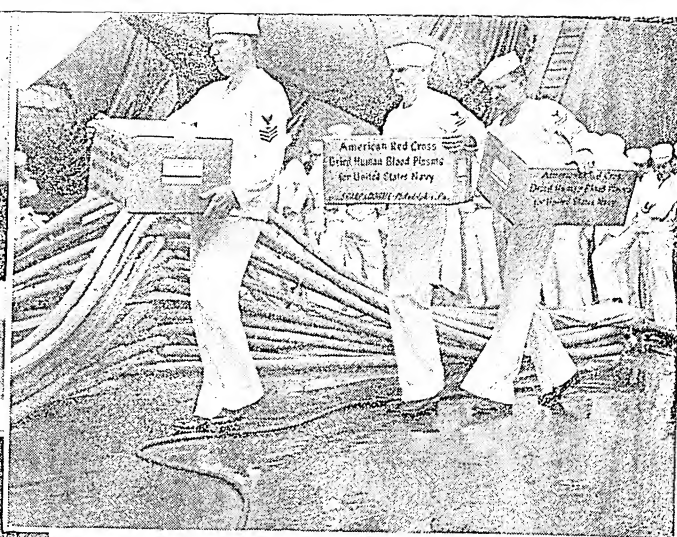
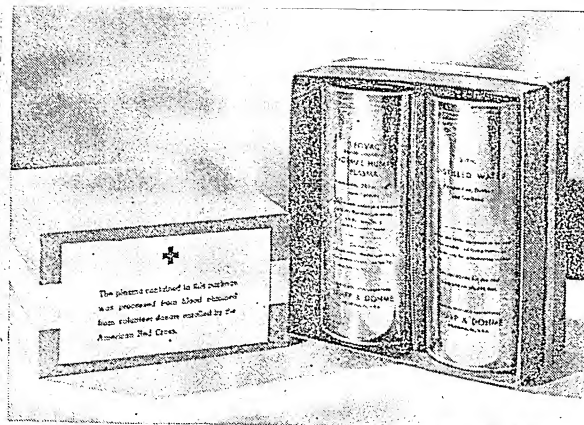
Each of the Geneva bodies has its own field of activity. Roughly speaking, the League is more active in time of peace and the International Committee in time of war.

Red Cross in the United States. Clara Barton, who had worked independently of the Sanitary Commission in the War between the States, was in Europe during the Franco-



Photos: U & U

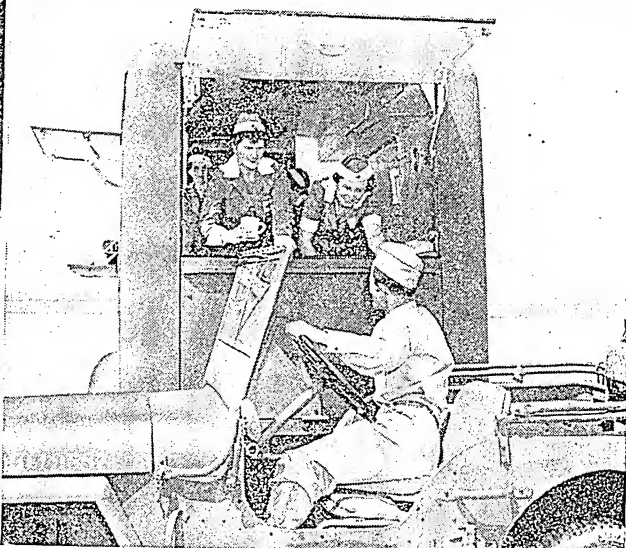
The Red Cross in World War I. Above, British and French wounded in a casualty clearing station, attended by Red Cross nurses. Below, wounded soldiers attended by nurses at Ostend, awaiting a boat bound for England.



ACTIVITIES OF THE RED CROSS

Blood plasma, obtained from volunteer donors by the Red Cross, is hermetically sealed in glass flasks, *first left*. During World War II, the plasma was used at the various fighting fronts and on every Navy ship, *above*. The plasma is restored to liquid form by adding distilled water before it is injected into the veins of the wounded or injured. *Second right*: A mobile canteen unit in operation at an army air base. *Third right*: A trained Red Cross hospital social worker and a doctor discuss a personal problem with a patient. *Third left*: The Red Cross Air Corps maintains planes for flying doctors, nurses, and medical supplies for those in need of help wherever they may be located.

Photos: American Red Cross; Acme.

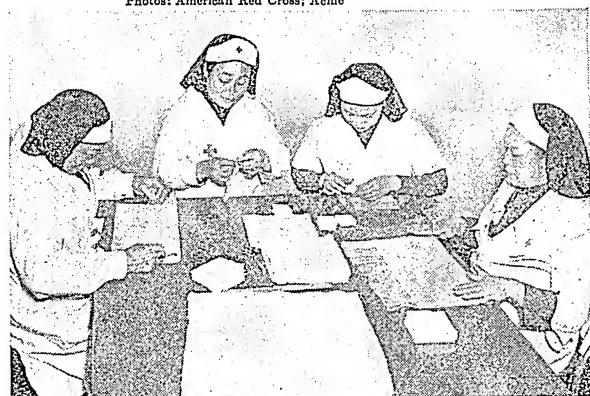




THE RED CROSS ON THE HOME FRONT

Top: A Red Cross Gray Lady helping to entertain sailors convalescing in a naval hospital. *Right:* Members of the Canteen Corps feeding refugee children on their arrival in the United States. *Below:* Chinese women, volunteer members of the Red Cross Production Corps at San Francisco, preparing surgical dressings for emergency use during World War II. *Lower left:* A Volunteer Nurses' Aide helping to inoculate a flood victim against typhoid fever. *Lower right:* A Home Service Aide, visiting the home of a serviceman, assists the mother and takes her child to a clinic for any necessary treatment.

Photos: American Red Cross; Aemo



Prussian War, and was deeply impressed by the good accomplished in combating suffering by the newborn Red Cross.

Upon her representations, President Garfield advised the Senate in 1881 to ratify the Geneva Convention. In that year, the American National Association of the Red Cross was incorporated in the District of Columbia with Clara Barton as president. Garfield's assassination delayed ratification of the treaty until March 1, 1882, when it was signed by President Arthur and accepted by the Senate a few days later without a dissenting vote.

The new Red Cross was a small and informal national committee of eleven members. It had no official connection with the government and most of its work was in disaster relief.

The first chance to show its real potentialities came in the Spanish-American War, but this work was done mainly by independent units. To secure a more efficient procedure, there was a reincorporation by Act of Congress on January 6, 1900. This new charter proved to be too short a step forward, however, and on January 5, 1905, President Theodore Roosevelt signed a revision of the act which constituted the Red Cross as it now exists.

Upon his acceptance, the President of the United States is president ex-officio of the American Red Cross. The chairman of the Central Committee is Norman H. Davis, appointed by President Roosevelt April 12, 1935, to succeed the late Rear Admiral Cary T. Grayson. The Central Committee governing the organization is composed of eighteen members, six of whom are appointed by the President to represent the Government. All Red Cross accounts are audited by the War Department and an annual report made to Congress.

In World War I. Through its formative years, while peace prevailed, the American Red Cross served in its appointed task of furnishing disaster relief at home and abroad, but it was the emergency of World War I that raised it to full stature. While the conflict raged, the number of Red Cross chapters grew from 562 to 3,724, with 17,186 branches. Membership increased from 486,000 to 20,000,000, and \$400,000,000 was raised for war relief and service expenditures.

Before the United States was drawn into the conflict, relief was extended to civilian war victims abroad, shiploads of food and clothing were dispatched, as well as ambulance companies and other hospital facilities. Then, while American troops were still training in camps at home, the Red Cross rushed special plans for services to them here and abroad. It enrolled 23,822 nurses, provided recreation facilities for service men, aided in the operation of military hospitals, and served as a link between fighting men and their families. Almost 2,000,000 refugees and prisoners of war were

provided with food, clothing, shelter, medical attendance, and employment.

On the home front, Red Cross operations rose like a tide. More than eight million volunteers produced 371,500,000 relief articles, and 500,000 families of soldiers and sailors were assisted by the Red Cross home service. Base hospitals were organized, ambulances furnished, and canteens maintained for servicemen.

American Junior Red Cross. Children were also enabled to do their part, as President Wilson created by proclamation the American Junior Red Cross. Eleven million boys and girls became members, and they made 15,700,000 articles for the sick and wounded, and created a National Children's Fund for the relief of children in Europe. Out of the resulting gratitude, grew an international correspondence between school children.

Between Wars. After the Armistice in 1918, as rapidly as possible the organization was converted to a peacetime basis. It co-operated closely with the Government in caring for the disabled and in aiding others who had to adjust themselves to the new era. Home service shifted emphasis to family case work for veterans and claims work for the disabled.

In the meantime, disaster relief facilities, various phases of nursing, first aid and water safety programs, and volunteer participation were expanded in preparedness for whatever emergencies might come. Hurricanes, floods, droughts, great fires, and the economic depression put this readiness to severe tests and then came the supreme challenge—Pearl Harbor and all that followed.

In World War II. The Red Cross was instantly in action when Hawaii was attacked, and as the nation girded for the struggle thus precipitated, and our armed forces began moving to many battlefronts, the task of the Red Cross assumed global proportions. By early 1943, it had more than 3,000,000 workers overseas, and had established 150 clubs and recreation centers for servicemen in Great Britain, Iceland, India, Australia, the Middle East, North Africa, Alaska, Northern Ireland, and other places where troops were sent.

Recruited by the Red Cross, more than 10,000 nurses were on duty with the army and navy by January, 1943, and young America responded by increasing Junior Red Cross membership to about 15,000,000, and undertaking various war tasks. At the request of the military heads, the Red Cross began collection of blood plasma to save the lives of wounded men. By 1943, 1,300,000 pints of blood had been obtained for the laboratories.

Red Cross field directors and other trained personnel were assigned to every army camp and navy station at home and overseas, as the communicating link between men in uniform and their families. In chapter workrooms, more

than a million women volunteers produced more than 500,000,000 surgical dressings within fifteen months after Pearl Harbor.

Throughout the nation, disaster preparedness facilities were strengthened. Co-operating with the Office of Civilian Defense, the Red Cross began training 100,000 nurse's aides, a similar number of nutrition aides, 500,000 canteen aides, and 1,000,000 women in the rudiments of home nursing.

In the first year of World War II, the Red Cross conducted relief operations in 172 disasters in which aid was given more than 72,434 persons. In the year 231,578 water safety and an alltime record of 3,600,000 first aid certificates were issued.

Chapter workers dealt with the problems of 122,662 disabled veterans or their families, while in hospitals and other facilities of the Veterans Administration, 43,701 cases were cared for. In 441 communities where other nursing facilities were not available, the Red Cross maintained 778 nurses. During the year 2,472 chapters completed 22,648 courses in home nursing, certificating 396,214 persons. Chapter volunteers produced 461,553 pages of Braille for the blind by hand and 302,228 by duplicating process, while 552,240 calls were answered by the motor corps and 587,291 persons were fed by canteen workers.

The plight of civilian victims of the war overseas elicited aid from the American Red Cross. By 1943, \$65,000,000 worth of food, medical supplies, and clothing was shipped abroad by and through it. More than one million food parcels were dispatched to American and other Allied prisoners of war.

At the end of the 1942 fiscal year, the American Red Cross had 3,755 chapters and more than 6,000 branches in the United States and insular possessions. Membership by 1944 rose to more than 15,000,000. G.S.B.

RED DRUM. See **REDFISH**.

RED-EARTH PEOPLE. See **INDIANS (Fox)**.

REDEEMER. See **JEHOVAH**.

RED EYE. See **COPPERHEAD**.

REDFISH, the name applied to several drum fishes, particularly to the *red drum*, or *channel bass*, a game fish abundant in the Atlantic coast waters of the Southern United States. The skin of this handsome fish is gray, with a coppery iridescence; sometimes it grows to be five feet in length and weighs seventy-five pounds, but usually it is much smaller. It is esteemed as a food fish, and is one of the most valuable products of the Texas fisheries.

The term is also applied to a red fish of Southern California, a richly colored fish with a thick, compressed body. It is of a crimson color, shading to blackish-purple on the fins, and is about three feet long, weighing from thirteen to fifteen pounds. Because of the fatty lump on its blunt forehead, this fish is also

called the *fathead*. It is caught in the kelp beds near the shore, and its flesh is prized, especially by the Chinese, who dry and salt it.

Redfish is also the Alaskan name for the red or blue-black salmon. See **SALMON**. L.H.

Scientific Names. The red drum is *Sciaenops ocellatus*; the California redfish is *Pimelometopon pulcher*.

RED FLAG. See **RED (As a Symbol)**.

REDLANDS, CALIF. See **CALIFORNIA (map)**.

REDLANDS, UNIVERSITY OF, a Baptist co-educational institution of the liberal arts, founded in Redlands, Calif., in 1907.

RED LEAD, a bright red powder made from unfused lead monoxide; sometimes found as a mineral. Used in making glass and matches, and as a noncorrodent in painting metals.

REDMOND, JOHN EDWARD (1851-1918), an Irish political leader, born at Waterford and educated at Trinity College, Dublin. He

studied law and was called to the bar in 1886, five years after his election to Parliament. Redmond's influence grew steadily in the House of Commons, and at the time of the rupture of the Irish party which followed the Parnell scandal, he pleaded eloquently for the discredited leader. On Parnell's death, Redmond became head of the Parnellites, and as such kept up a bitter antagonism to the other section of the Irish party. In 1900, however, when the two sections joined to form a new Nationalist party, he became the accepted leader, and took a prominent part in all the subsequent movements relating to the question of Irish Home Rule.

In 1915 Redmond was offered a place in the English Coalition Cabinet, formed for more effective prosecution of the war, but he declined the honor. He was shocked and horrified by the Dublin rebellion of 1916, and offered to help the English government in an attempt to reach a settlement. Redmond played an important part in the Irish convention of 1917 but did not live to see the establishment of the Irish Free State. See **HOME RULE**; **IRELAND (History)**; **PARNELL, CHARLES STEWART**.

RED POLL. See **CATTLE (Dual-Purpose Cattle)**.

REDPOLL. See **LINNET**.

RED PUCCOON. See **BLOODROOT**.

RED RIVER, the southernmost of the more important tributaries of the Mississippi, has its source in several headstreams of northern

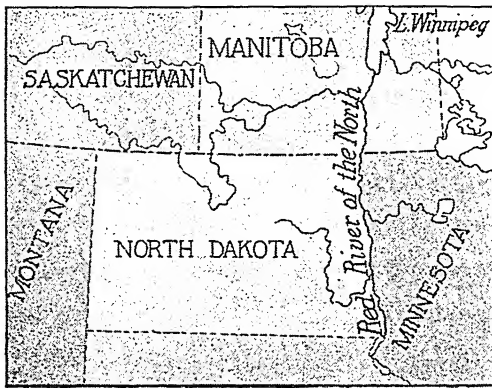


Photo: Brown Bros.

JOHN REDMOND

Texas. The main stream follows an easterly course between Texas and Oklahoma, enters Arkansas, and, cutting across the southwestern corner of that state, flows southeasterly through Louisiana until it reaches the Mississippi. The two rivers unite 341 miles above the mouth of the Mississippi. The Red River has a length of about 1,200 miles; its drainage basin covers 90,000 square miles. For seven months of the year, light-draft boats ascend the river to Shreveport, 350 miles above its junction with the Mississippi. See LOUISIANA (Rivers).

RED RIVER OF THE NORTH, a waterway of the United States and Canada, one of the three great rivers which flow into Lake Winnipeg and thus form part of the Saskatchewan-Nelson system. Practically its whole course



COURSE OF THE RIVER

lies through a level plain which was in pre-historic times the bed of Lake Agassiz (see AGASSIZ, LAKE). This plain, the Red River Valley, is one of the richest wheat-growing areas in the world. The river itself has been utilized in the production of power for manufacturing in the cities along its banks. Among these communities are Fargo and Grand Forks, the two largest cities in North Dakota; and Winnipeg and Saint Boniface, in Manitoba. The river is navigable from Grand Forks to Winnipeg, but is of comparatively little importance as a commercial stream. About 100 miles of its course is in Manitoba.

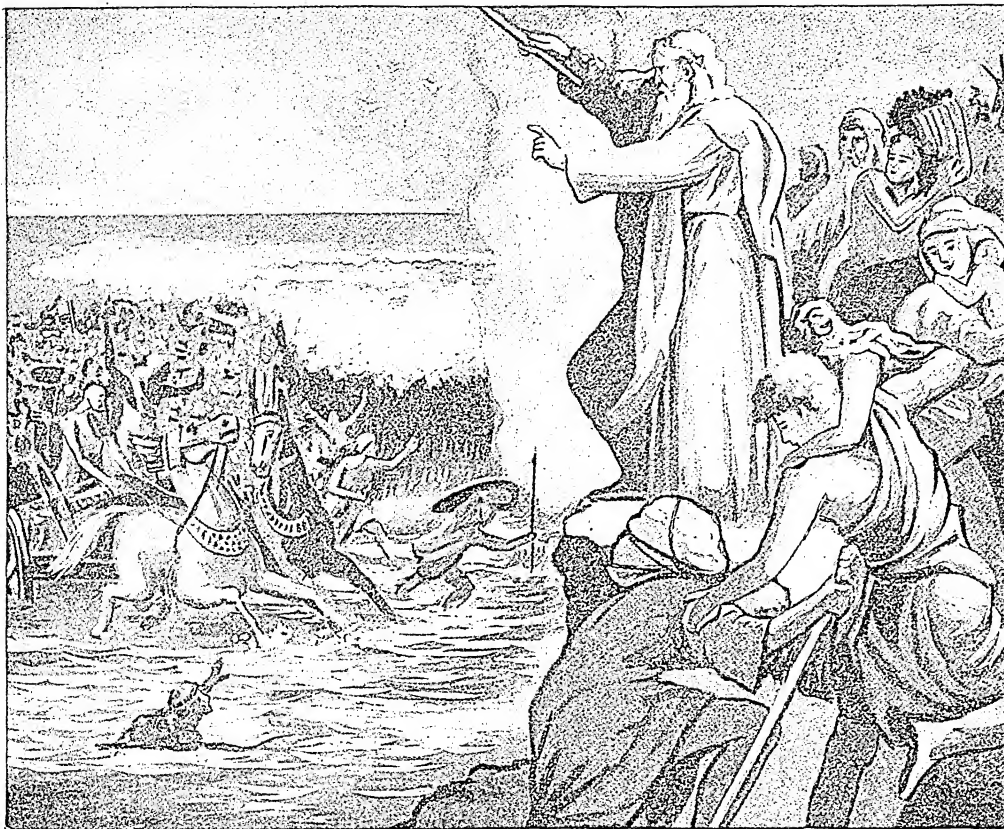
The Red River rises in the west-central part of Minnesota, only a few miles west of the headwaters of the Mississippi. After describing a small curve to the south and west, it turns northward at Wahpeton, N. D., and forms the boundary between Minnesota and North Dakota. At Wahpeton it receives a branch from the south, the Bois de Sioux River, which forms the remainder of the boundary between Minnesota and North Dakota and extends for a few miles as the boundary of South Dakota. The source of the Bois de Sioux is Lake Traverse, one of the many small lakes which are to be found in northern Minnesota.

RED RIVER REBELLION, an uprising of the half-breeds in the Red River Valley against the Canadian government in 1869-1870. In 1869 the Hudson's Bay Company transferred its territorial rights in Rupert's Land to the British government, and the latter in 1870 transferred the district to the Canadian government. At that time, the only occupants of the great Northwest were Indians, a few scattered traders, and about 12,000 settlers in the Red River Valley. These settlers, who were chiefly half-breeds, or *métis*, lived a simple agricultural life, on lands to which they had no legal title; when they tired of a plot of ground, they moved to some other spot which suited them.

Under the beneficent despotism of the Hudson's Bay Company, the half-breeds had lived much as they pleased. On this community there suddenly descended, without warning, bridge and road builders, surveyors, and officials of all kinds. Their lands, which were arranged on the old French plan of strips reaching back from the river fronts, were now to be arranged in townships and sections. The first thought of the half-breeds was, naturally, that the new government would disregard their interests. Amid the general excitement, it is no wonder that the fear and discontent of the *métis* should find expression.

The storm center was Louis Riel. With the news that the Honorable William McDougall, Dominion appointee, was on his way to assume the governorship of this new territory, Riel and his followers determined to prevent him, if possible, from organizing a new government. The *métis* seized Fort Garry (now Winnipeg), set up a "provisional government," and prepared to resist the authority of the Dominion government. McDougall was stopped at the boundary of Rupert's Land, and was forbidden to enter. Fortunately, he had the good sense to see that the *métis* had a real grievance, and he obeyed Riel's order as a means of preserving peaceful relations.

But an inexplicable act of Riel's ended the prospect of a friendly settlement. In order to terrorize his opponents, Riel imprisoned a few "enemies of the provisional government," among them a young fellow named Thomas Scott. For some reason, Scott was picked as an example, was condemned as a traitor to the provisional government, and was shot. This was cold-blooded murder, and created tremendous indignation in Eastern Canada. Under the command of Colonel Garnet Wolseley, a force of 700 men, both regulars and volunteers, made the long and wearisome journey westward by way of Lake Superior. At the approach of the troops, Riel seemed to lose all joy in his office as head of the "provisional government," and promptly fled to the United States. His flight ended the rebellion.



THE EGYPTIANS ARE OVERWHELMED IN THE RED SEA

The artist's conception of the tragedy so vividly described in *Exodus* XIV.

Even while Wolseley and his men were marching westward, the Dominion Parliament admitted Manitoba as a self-governing province of the Confederation. The claims of the half-breeds were met by setting aside 1,400,000 acres for their use. Unfortunately, many of the half-breeds continued to wander westward, and a few years later again caused difficulty, in what was known as the Saskatchewan Rebellion.

G.H.L.

Related Subjects. The reader is referred in these volumes to the following articles:

Canada (History)

Hudson's Bay Company

Riel, Louis

Rupert's Land

Saskatchewan Rebellion

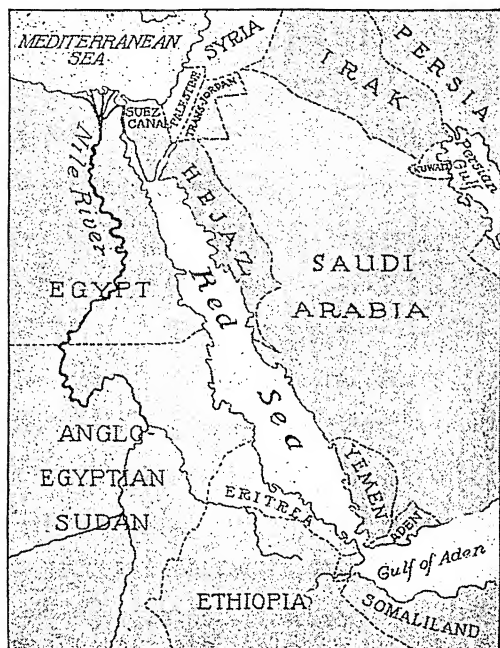
Wolseley, Garnet Joseph

RED SEA, an arm of the Indian Ocean, about 1,200 miles long, which separates the Arabian Peninsula from Northeastern Africa. Since the construction of the Suez Canal (which see), the Red Sea has been the great water highway between Europe and the Orient. It has many disadvantages as a trade route, because, except for a central channel twenty miles wide, the sea is very dangerous even to small vessels, and the climate is damp and made intensely hot by the burning winds off

the African desert; yet, were it not for this passage, the enormous volume of trade between the European countries and Japan, China, and India would follow an overland route, as it did centuries ago, or proceed by way of the Cape of Good Hope. The sea is long and narrow, never exceeding 200 miles in width, and its average depth is about 2,000 feet. The total area is about 160,000 square miles, an area slightly larger than that of the state of California.

Geologically, the Red Sea is nothing but a great crack in the solid rock that has filled with water. The shore is barren, and there are few harbors in the desert regions. On the east are high mountain ranges; on the west, low sand hills and rocky table-lands, skirted by numerous coral reefs. Because of the great evaporation resulting from high winds and the excessive heat, usually above 100°, the Red Sea waters are very salty. The marine flora and fauna are especially rich, differing widely from those of the Mediterranean. The story of the passage of the Children of Israel across this sea is one of the most entertaining of Bible narratives. It is told in *Exodus* XIV.

Various explanations are offered for the origin of the name *Red*. Among these are the color of the surrounding hills, of the coral reefs,



THE RED SEA

of the seaweed, and of the water, which has been affected by the presence of myriads of animal organisms. During World War II the British mined the southern entrance to the Red Sea, sank Italian naval craft, and took Eritrea's key port of Massawa in 1941.

RED SEEDS. See HERRING.

RED SPIDER. See MITES.



Photo: Visual Education Service

THE REDSTART

REDSTART, the most graceful of American warblers (which see). It is known to the in-

habitants of Cuba, from its quick, darting movements among the dark forests, as "Candelita," the little torch. It is a summer resident over the greater part of North America, from Canada to Mexico, and in the winter months is found in Cuba, the West Indies, and Northern South America. The adult male is a shining black, with vivid, salmon-red markings. In the plumage of the female and young, the black is replaced with brown, and the salmon becomes a dull yellow. The redstarts spread their tails like fans when in flight. They nest in trees, and their eggs, four or five in number, are a creamy-white, blotched with reddish-brown or lavender. The redstarts feed chiefly on insects and are beneficial to agriculture.

D.I.

Scientific Name. The American redstart belongs to the family of wood warblers, *Mniotiltidae*. Its scientific name is *Setophaga ruticilla*.

RED-TOP. See GRASS (illustration).

REDUCING WEIGHT. See OBESITY.

REDUCTION PLANT. See SEWAGE AND SEWERAGE.

RED WING, MINN. See MINNESOTA (back of map).

RED-WINGED ORIOLE. See BLACK-BIRD.

RED-WINGED STARLING. See BLACK-BIRD.

REDWOOD, a giant, cone-bearing tree of the Western United States, belonging to the *Sequoia* genus. The tree is described in these volumes in the article SEQUOIA (Redwood).

REED, JAMES A. (1861-), United States Senator from Missouri for three terms (1911-1929). As Democratic leader in the Senate, he was a colorful figure, known for his courage, honesty and firm convictions. A gift for oratory, which included a most successful use of invective, was an important asset in keeping him before the public. Twice (1924, 1928) he was a Democratic candidate for the nomination for President, but withdrew both times.

Reed was born near Mansfield, O., but received his education and entered the profession of law in Iowa. In 1887 he moved to Kansas City, where he immediately became a leader in Democratic politics. Many reforms were introduced in Kansas City from 1900 to 1904, while he was mayor of the city. From 1908, when he served as delegate at large to the Democratic National Convention, until his retirement, in 1929, he was an active figure in national politics. Senator Reed vigorously opposed America's entrance into the World War, as well as President Wilson's efforts to have the country join the League of Nations. After completing his third term, he returned to Kansas City as a senior member of a law firm.

REED, STANLEY F. See SUPREME COURT OF THE UNITED STATES.

REED, THOMAS BRACKETT (1839-1902), an American Congressman who earned the nickname of "Czar" Reed by introducing into the House of Representatives a code of rules which put an end to filibustering and made it possible for the majority to transact business in the face of opposition. Under the new ruling, a quorum was obtained by authorizing the Speaker to count as present members who refused to vote but remained in their seats. The "tyranny of Czar Reed" was the leading subject discussed in politics. The Supreme Court sustained the innovation.



Photo: Brown Bros.

THOMAS B. REED

Reed was born in Portland, Me., graduated from Bowdoin College in 1860, and practiced law in Portland. He was a paymaster in the navy during the War of Secession. He was elected successively to both branches of the Maine legislature. From 1870 to 1872, he was attorney general of the state of Maine. He was a member of the national House of Representatives from 1877 to 1899, and Speaker for six years. In 1896 he was an unsuccessful candidate for the Republican nomination for President. He wrote *Reed's Rules*, a book on parliamentary law.

REED, WALTER C. (1851-1902), a major in the United States army. He was born and received his education in Virginia. After practicing medicine in New York he entered the army in 1875. In 1900 he headed a commission of army surgeons which was sent to Havana to investigate yellow fever. As a result of the heroic work of Dr. Reed and his co-workers, Carroll, Lazear, Agramonte, and a number of volunteers, it was clearly shown that the mosquito is the transmitting agent in the spread of yellow fever, thus laying the foundation for control of the disease. C.G.H.

REEDBIRD. See BOBOLINK.

REED CANARY GRASS. See GRASS.

REED'S RULES. See REED, THOMAS B.; PARLIAMENTARY LAW.

REEF. See ATOLL; CORAL.

REELFOOT LAKE. See TENNESSEE (Rivers and Lakes).

REESE, LIZETTE WOODWORTH (1856-1935), an American poet whose work has simplicity, intensity of emotion, and perfection of technique. All of her life was spent in Baltimore, where she was born of English and German parentage. It is believed that her English parentage and the country around Baltimore, which has all the charm of Sussex,

greatly influenced the poet and gave her lyrics the traditional note dominant in English poetry. Again and again she wrote of lilacs in Old York Lane, of thorn trees, of Judas trees, and daffodils.

After studying in public and private schools, Miss Reese taught English in Western High School, Baltimore, until her retirement, in 1921. In 1923 the alumni, teachers, and pupils of the high school presented to the school a bronze tablet inscribed with her poem *Tears*, one of the most famous sonnets written by any American:

When I consider Life and its few years—
A wisp of fog betwixt us and the sun;
A call to battle, and the battle done
Ere the last echo dies within our ears;
A rose choked in the grass; an hour of fears;
The gusts that past a darkening shore do beat;
The bursts of music down an unlistening street—
I wonder at the idleness of tears.
Ye old, old dead, and ye of yesternight,
Chieftains, and bards, and keepers of the sheep,
By every cup of sorrows that you had,
Loose me from tears, and make me see aright
How each hath back what once he stayed to weep;
Homer his sight, David his little lad!

Her first book, *A Branch in May*, appeared in 1887, and in its crisp lines we find an intensity of emotion foreign to the poetry of the eighties. Three more slim volumes followed, and then, from 1909 to 1920, nothing came from her pen. Suddenly her work appeared again, and *Spicewood* (1920), *Wild Cherry* (1923), and *Little Henrietta* (1927) have lines more skilful, more concise, and as spontaneous as any in her earlier poems. In 1929 appeared *A Victorian Village*, an unconventional autobiography.

REEVE, the female ruff. See RUFF; see, also, SHERIFF, for the reeve in government.

REEVE, ARTHUR BENJAMIN (1880-1936), an American writer of fiction whose scientifically solved mysteries gave him a rank in this form of literature not far below that enjoyed by A. Conan Doyle. He was born in Patchogue, N. Y., and was graduated at Princeton University (1903). Reeve held in turn the posts of assistant editor of *Public Opinion*, editor of *Our Own Times*, and member of the staff of *The Survey*. In fiction, his most pretentious stories center around a character named Craig Kennedy, who called science to his aid in solving baffling mysteries in the criminal world. Reeve also wrote several mystery serials for the moving pictures.

Leading Books. Reeve produced more than thirty volumes of his own, and collaborated with other authors in the publication of about a dozen more. His works include, besides the Kennedy stories, *The Mystery Mind*, *The Film Mystery*, *Atavar*, *The Fourteen Points*, *The Return of the Riddle Rider*, *The Radio Detective*, and *Pandora*. One of his earlier successes was *The Dream Doctor*.

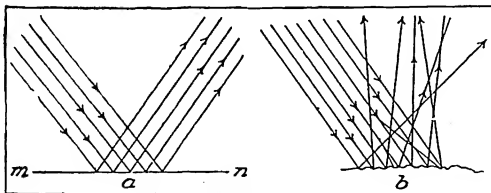
REEVE, WINIFRED EATON (1879-). Pen name, Onoto Watana. See CANADIAN LITERATURE (English Canada: Fiction).

REFERENDUM, *ref ur en' dum*, a progressive political principle. See INITIATIVE AND REFERENDUM.

REFINING. See METALLURGY; PETROLEUM.

REFLECTING GALVANOMETER, *gal vah-nom' e tur*. See CABLE, SUBMARINE.

REFLECTION, *re flek' shun*. A ball thrown against a wall will bound back into the space



REFLECTION OF LIGHT

(a) Regular reflection of rays from the plane surface $m n$; (b) diffused reflection from an uneven surface.

through which it came. If it strikes the surface at an acute angle, it will rebound at an acute angle with that surface, and the two angles will be equal. These statements illustrate concretely what happens when a ray of light, heat, or sound (a wave of radiant energy) strikes upon a surface; it is turned back, or *reflected*. The angle at which a wave of radiant energy strikes a surface is called the *angle of incidence*, and the angle at which it is turned back is the *angle of reflection*. As stated above, these angles are equal.

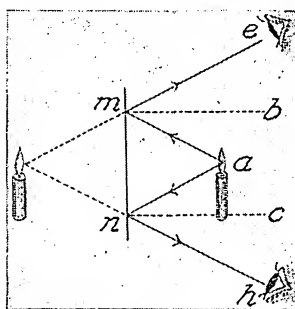


IMAGE FORMED BY A MIRROR

The mirror is represented by $m n$. An observer at e whose gaze rests upon the mirror at m will see there the reflected light from the candle a . The line $m b$ bisects the angle $e m a$, and helps to visualize the fact that the angle of incidence is equal to the angle of reflection. The same effect is produced if the observer is below the mirror, at h .

A.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Echo	Mirror
Light (Reflection)	Sound

REFLEX. See RADIO COMMUNICATION (Glossary of Radio Terms).

REFLEX ACTION. If you place your hand on a hot stove, you withdraw it before you have time to think. A sudden and unexpected sound may cause you to jump and possibly to scream. Did you intend to jump? "No," you

reply, "I did it before I knew it." These and similar acts are good examples of reflex action, caused by the communication of a sensory with a motor nerve through a nerve center. The term is generally restricted to involuntary acts like those mentioned above, and to acts of which we are unconscious.

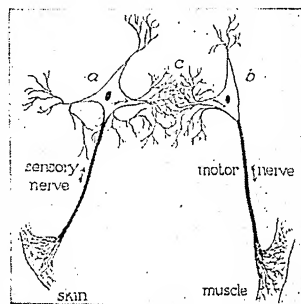
The simplest form of reflex action is shown in the accompanying diagram, which illustrates what physiologists term the *reflex arc*. The surface of the skin is touched, and the impulse traverses the sensory nerve to a , the sensory

nerve cell. At c the fibers of this cell interlace with those of the motor nerve cell b , and the impulse is carried along the motor nerve to the muscle, which it causes to contract. A study of the diagram shows that the following mechanism is necessary to produce a reflex act: a sensitive surface, usually the skin; a sensory nerve; a motor nerve connecting with a muscle, gland, or blood vessel; and a nerve center in which these nerves connect. This is the simplest form of reflex arc, and we have described the simplest reflex act. There are, however, some reflex acts that are very complex. Some of them control the action of glands, and others affect the circulation and respiration.

Reflex acts of the spinal and cranial nerves are performed more quickly than voluntary acts, because they involve less complicated adjustments within the nervous system. They often protect the body from injury. Before you were aware that your hand was on a hot stove, it had been jerked away, or the sensory impulse may have divided at the reflex center and part of it gone on to the brain; in that case, you felt the pain so near the instant you moved your hand that the sensation and the movement seemed to coincide. The time for a reflex act of this sort is from six-hundredths to eight-hundredths of a second.

The chief reflex centers for involuntary reflex action are in the medulla oblongata and the spinal cord, but smaller centers are located in different parts of the body. As we have seen, some of the sensory impulses may be carried to the brain; therefore not all reflex acts are unconscious. Many acts that are begun voluntarily, such as walking, later become reflex and are continued without further attention. All reflex action is for the protection of the body, or for conserving the various higher activities of the brain.

K.A.E.



REFLEX ACTION ILLUSTRATED

Related Subjects. The following articles should be read in this connection:

Brain (Medulla Oblongata)	Instinct
Habit	Nervous System

REFLEXOLOGISTS. See **PSYCHOLOGY** (Modern Movements: Behaviorism).

REFORMATION, *ref or ma' shun*, **THE**, a great religious movement of the sixteenth century which resulted in the establishment of Protestantism. The leader of this great movement was Martin Luther, a German monk and scholar, conscientious, deeply religious, and utterly without personal ambition. It is no longer possible to regard the Reformation solely as a religious movement, merely a sudden break with the Roman Catholic Church. Scientific study and researches on the part of both Protestant and Roman Catholic scholars have clearly revealed also great economic and political forces at work at the time. In his leadership of the great Reformatory movement, Luther fanned into flame the smoldering thought of generations.

The direct result of the Reformation was the founding of Protestant Churches in Germany and parts of Switzerland, in England and Scotland, and in the Scandinavian countries. In every case, the reformers justified the changes they instituted by appealing to the Bible as their authority. The establishing of the Protestant faith, which brought about a division of Western Christianity into two branches, Protestants and Roman Catholics, later resulted in religious wars, both foreign and civil, which kept Western Europe turbulent for nearly a century and a half, from the Diet of Augsburg in 1530, at which the German Protestant princes submitted the "Augsburg Confession" (their confession of faith, which resulted in the Schmalkaldic League), until the English Revolution and the League of Augsburg, in 1688.

The power of the Church of Rome at the time of the Reformation was very great. For a thousand years it had been uniting politically with the governments of Europe, had been building itself into the life of the people, with the Pope, called the Bishop of Rome, in supreme authority over every temporal ruler. Its enormous wealth was devoted partly to social purposes. Its intellectual and social influence was a powerful force. Few questioned its divine authority. It was a stronger institution than any of the existing governments. The kingdoms of Western Europe were at that time very unstable, with their shifting boundaries, their incessant wars, and their deep-rooted class antagonisms. Spain, France, England, and Germany, however, were all trying to build up strong, centralized governments and were succeeding.

Feudalism was dying out. The relations between the rulers and their princes, and between

the princes and their vassals, had weakened. No real control was exerted by the king of any country over the heads of the separate provinces under him. Each prince or overlord was the real ruler of his state; but for purposes of defense against foreign invasion and aggression, and in self-defense against the peasant classes, who were in all countries hostile to the aristocracy, king and nobles tended constantly to unite.

The foreign wars had at this time reduced the great masses of the population to bitter want. They were victims of every abuse, and were plundered by the higher classes of society. Then came the revival of learning, which brought into being another distinct class, the scholars. Up to the beginning of the period called the Renaissance, education and access to books had been chiefly the privileges of the aristocracy and the Church. But after that time, they became the heritage of increasingly large numbers of men. Universities and schools sprang up everywhere, and the towns were thronged with students. It was from the ranks of these students that the leaders of the common people were drawn—Wycliffe in England, Huss in Bohemia, Erasmus in Holland, Luther and Melancthon in Germany, Zwingli (followed by Calvin) in Switzerland—men who stirred and inspired the people with their religious teachings. In them the people found champions who had no personal ambitions and no material gain in view. In addition, the scholars of all countries tended to gather in the different university towns, and there to exchange ideas and to carry the culture and beliefs of others back to their own countries. The Reformation owed much of its success to the rapidity with which Luther's ideas and teachings were thus spread abroad.

Erasmus had noted the abuses of power and privilege which had arisen in the Church, and had by his writings attempted some reform. Luther, when he nailed his protest on the church door in Wittenberg, in 1517, was attempting to do the same thing. He protested against specific evils; individuals within the Church, rather than the Roman Church itself, he held responsible. His act was a challenge to a debate; it was in line with the established custom among the students and scholars of university towns. Probably no one was more surprised than he when his theses, which had been written in Latin, were translated into German and other languages and were circulated throughout Europe. Later when the attention of all Western Europe had centered on the quarrel between the Pope and a German monk, and Luther had to choose between retracting what he had said or being denounced by Rome as a rebel, he chose the latter course. When Leo X issued a bull threatening him with excommunication, he publicly burned it in Wittenberg, December 10, 1520.



Photo: O R O G

A SECTION OF THE "MONUMENT OF THE REFORMATION"

The monument depicts in bas-relief historic scenes connected with the Reformation, and presents long inscriptions in Latin, Greek, French, German, and English. The bas-relief above shows Henry IV of France signing the Edict of Nantes (1598). See NANTES, EDICT OF.

The situation in Germany at this time, about 1520, was very favorable to Luther's cause. The nobles and rulers in general resented the Pope's claim to the right to interfere in the internal affairs of their country. The Pope even claimed the right to fill all vacancies which occurred in the Church; the rulers naturally desired to fill these vacancies with their own friends and supporters. And, what was perhaps most unsatisfactory of all, a ruler, confronted with an empty treasury and the necessity of a foreign war, had before him the spectacle of the enormous wealth of the Church, exempt from taxation.

Charles V had just been elected ruler of the German provinces on the death of his grandfather, Maximilian. But Charles was more Spanish than German, and was king, as well, of Spain and Sicily, Naples and Sardinia, lord of the Netherlands and Burgundy and of the Austrian Grand Duchies. Ambitious for further conquests, Charles could ill afford to offend the Pope. So, realizing nothing of the situation in Germany and the strength of Luther's following, he was persuaded to issue a decree against Luther at the Diet of Worms, and then left Germany to be gone for the next ten years, engaged in wars with France.

The German princes felt no particular loyalty to Charles, and they did feel antagonism toward the demands of the Pope. Some of them were men of courage and high ideals, who understood and sympathized with Luther's

position and accepted his religious views, and he found strong supporters among them who refused to suppress his writings or to enforce the king's edict. The only effect, practically, of Charles' decree was to make it necessary for Luther to exile himself for a while in the castle of the Elector of Saxony, where he spent a part of his time translating the New Testament into the German language.

Luther proved himself an able leader of the tremendous forces he had released, and this, added to his deep religious enthusiasm, had much to do with the ultimate success of the movement. The Reformation did not take root, however, without bloodshed. One of the results of the movement was the Peasants' War of 1525. Another was the formation of the Schmalkaldic League, a confederation of German princes. The concession which the Lutheran princes finally won, together with the name *Protestant* (1529), was that each ruler should have the right to decide what was to be the religion of his people, and that the followers of another religion were not to be persecuted. This decision did not, however, settle the matter, but led eventually to the Thirty Years' War.

Switzerland. An entirely independent movement was going on in Switzerland at the time of the Reformation in Germany, under the leadership of Ulric Zwingli, also a great preacher and a noted humanist. In the civil wars which followed the attempts to suppress

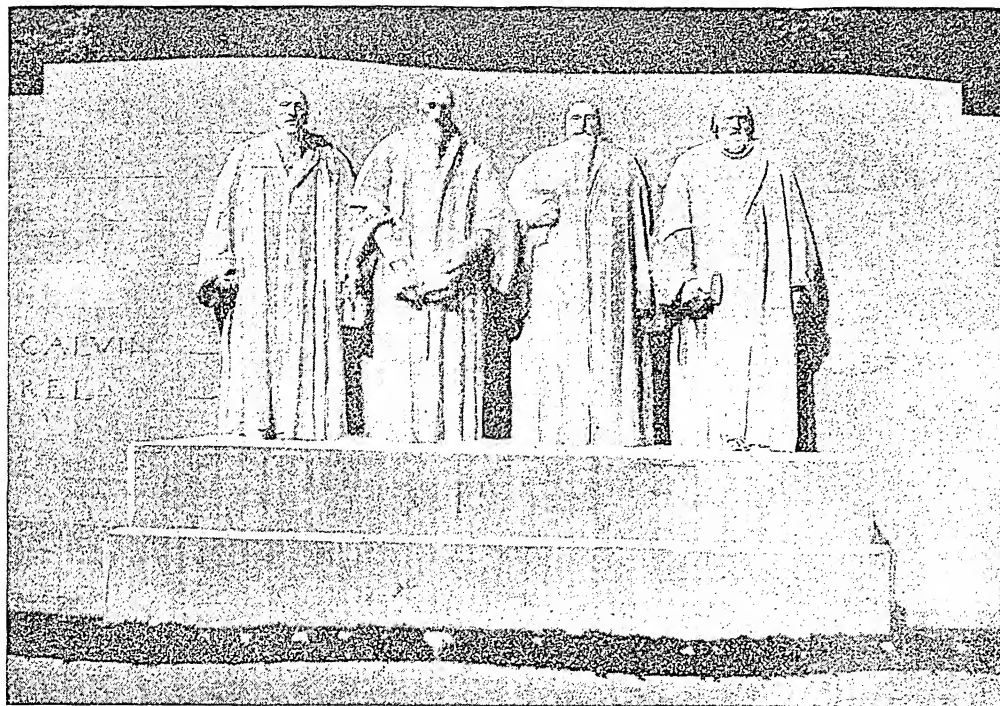


Photo: O R O C

A SECTION OF THE "MONUMENT OF THE REFORMATION"

On a pedestal in the center are carved images of Calvin, Farel, Beza, and Knox. The monument is in Geneva, Switzerland.

his teachings, Zwingli was killed (1531), but the separate provinces in Switzerland won the same concessions as had the German provinces—the right of each separate state to choose its own religion. In Geneva, John Calvin, a new leader, had appeared; he was a young Frenchman who had been exiled for his religious beliefs. Under his leadership, Geneva became the theological center of the new faith. The city was thronged with refugees and exiles, who studied under him and carried his teachings away with them into other countries. His own confession of faith differed in many respects from that of the Lutherans, and resulted in the founding of the powerful Calvinistic branch of the Church.

France. In France (and in Spain, as well) the State Church and the government had managed to achieve a good degree of independence from Rome before the Reformation period. The central government, having forced all the concessions it desired from the Pope, had nothing to gain by furthering or supporting Protestantism. In spite of persecutions, however, and the banishment of leaders like Calvin, nearly every province in France had many converts, who eventually formed a distinct political party known as the *Huguenots*. For over thirty years, France was torn by religious wars, with occasional intervals of peace. One of the tragic occurrences was the massacre of Saint

Bartholomew's Day, in 1572, when thousands of Huguenots were put to death. In the end, the Reformation failed. By the Edict of Nantes, in 1598, the Huguenots were tolerated, but France remained a Catholic country until 1905, when the connection between the Church and the State was dissolved.

Scandinavia. In 1523 Sweden broke away from the union with Denmark and Norway. The king and the new government were not wholly displeased when the Reformation spread from Germany into the Scandinavian countries. Men schooled in the Protestantism of Luther, under the leader himself, carried the new faith northward. The Roman Catholic religion was discarded and its episcopal authority denied throughout Norway and Denmark in a national convention which met at Copenhagen in 1537. In Sweden the same result was accomplished ten years earlier (1527). The Augsburg Confession was adopted, and services in the Swedish language were substituted for those in Latin. In Denmark the pupils of Luther who came into the country were encouraged by an ambitious king, Christian II, and the movement was also furthered by his successor, Frederick I. On Frederick's death, in 1533, when the question of succession again arose, the Protestants supported one heir, the clergy and Catholic nobles another, and

civil war resulted. The Protestant prince, Christian III, was seated, and Protestantism won.

The Netherlands. It was natural that a country so close to Germany as was the Netherlands should adopt the new faith, and equally natural that a people so bitterly oppressed by foreign powers should stand together for political and religious freedom; but neither was won without torture and hate and persecutions, and weary years of war. The best generals that Spain could furnish were sent into that little country to put down the rebellion, and they failed. The nobles fought side by side with the common people, and, when they could fight no longer, they cut the dikes and let in the sea on the enemy. In the end the northern half of the country, Holland, under the leadership of William of Orange, won complete independence from Spain and Rome. But Belgium, the southern half, remained Catholic.

England. The Reformation in England was unique, because it began simply with a change in the constitution of the Church. As a result of a quarrel between Henry VIII and the Pope, the king announced that he, and not the Pope, was the head of the Church in England, that the sovereign always had been the titular head of the Church, and that the allegiance to the Pope that had been given by the English Church in no way abrogated this position. The English Church does not consider that this resulted in the establishment of a new Church, but that, with the addition of certain reforms, and failure to acknowledge the Pope, the Church continued, unbroken, its ancient existence.

During Edward VI's reign, protestation against the Church at Rome was encouraged by his nobles and advisers, but there were many stormy periods ahead. Under Queen Mary, a Catholic sovereign, a violent reaction followed. The Protestants were terribly persecuted, and many of their leaders were burned to death. Everything was undone that had been gained for Protestantism during the two reigns preceding. Elizabeth, Mary's successor, repudiated the Church of Rome; at the same time she did not favor extremes in Protestantism, and the followers of both faiths suffered under her tyranny. The religious differences arising between the two parties were a source of controversy and trouble for more than one hundred years, and no satisfactory settlement was reached until 1689, when a Toleration Act granted a limited amount of religious freedom.

A number of attempts were made by Rome to secure the renewed allegiance of the English Church, even to the acceptance of an English prayer book, and the saying of mass in English instead of Latin, but without avail. Finally, the Pope required all priests in sym-

pathy with him to leave the country. Not more than a hundred clergymen responded. The Anglican Church continues as a separate organization, wholly independent of the Church of Rome. It became the State Church, and is known as the Church of England.

Scotland. Scotland had a great leader named John Knox, a friend and pupil of John Calvin, who held much the position there that Luther held in Germany. Although the adherents of the new faith were cruelly persecuted and many of their leaders died at the stake, Knox succeeded in establishing a Calvinistic Church. Mary Stuart, during her short reign, tried to reestablish the old faith, but Knox's leadership was strong, and Protestantism prevailed. See illustration, page 3809.

Ireland. Without much resistance, Ireland espoused the ancient Church of England. Queen Mary promptly forced the Irish to repudiate it upon her accession to the throne, and Elizabeth as promptly forced them to accept it again. But the great mass of the people were entirely unaffected by these changes. In spite of them, Ireland continued then, and is to-day, a Roman Catholic country, except that the northern counties are strongly Protestant.

Results of the Reformation. In Spain and Italy, every encroachment of the Reformation was promptly and effectively checked. So, roughly, Protestantism was adopted by the countries of northwestern Europe, while Catholicism remained the faith of the peoples of the south, even the southern parts of Germany continuing loyal to the Church of Rome. Roman Catholicism had then and has today more adherents than has Protestantism. This condition was due in part to the Counter-Reformation by and within the Roman Church itself, by which the great Protestant movement was counteracted and checked. Through this Counter-Reformation, the Church of Rome regained much that had been lost through the Reformation. In this movement to counteract the spread of Protestantism, Jesuitism was the Church's agency and the Inquisition an important instrument. As a result also many abuses within Rome were abandoned. L.F.G.

Related Subjects. In connection with this discussion of the Reformation, the reader may find the following articles in these volumes of interest:

Augsburg Confession	Knox, John
Bull	Luther, Martin
Calvin, John	Melanchthon, Philipp
Catharine of Aragon	Nantes, Edict of
Charles V (Holy Roman Emperor)	Peasant War
Church of England	Pope
Counter-Reformation	Protestant
Eck, Johann M. von	Renaissance
Erasmus, Desiderius	Roman Catholic Church
Henry (VIII, England)	Saint Bartholomew's
Huguenots	Day, Massacre of
Huss, John	Schmalkaldic League
Indulgence	Tetzel, Johann
	Thirty Years' War

Tyndale, John
Wycliffe, John

Zwingli, Ulrich

The subtitle *History* in the articles on the various countries mentioned may also be consulted.

REFORM BILL OF 1832. See GREAT BRITAIN (The Reform Era).

REFORMED CHURCH, a term applied in a general sense to that branch of Protestantism in which the Calvinistic, instead of the Lutheran, doctrine prevails. In Europe the Reformed organizations are usually called Calvinistic, and in some countries the term Protestant Church is equivalent to Lutheran Church. The Reformed Churches (generally considered) are those of England, Scotland, the Netherlands, Switzerland, and some German provinces, as well as the greater part of the Protestant Church of France (see HUGUENOTS), and many churches in America which have sprung from those in Europe.

In America there are a number of Protestant bodies that use the name Reformed as a specific part of their titles. These include the Reformed Church in America, Christian Reformed, Associate Reformed, Hungarian Reformed, Evangelical and Reformed, and the Reformed Episcopal churches. The latter separated from the Protestant Episcopal Church in America in 1873, as a protest against the restoration of ritualism in the parent Church, and the adoption of so-called Roman dogmas. It repudiated apostolic succession. W.D.B.

REFORM SCHOOLS, OR INDUSTRIAL SCHOOLS, are state institutions for the education of boys and girls who need corrective influences. Reformatory education is usually resorted to after the efforts of home, public school, and juvenile court have proved inadequate to restrain the tendency to crime. A medical officer determines which children must be permanently restrained, because of feeble-mindedness or physical abnormality, and supervises the health of all. Separate institutions are maintained for boys and girls, but the aims of the two are similar—the development of character rather than the infliction of punishment. All are taught occupations and trades, with the idea of diverting the mind into constructive channels and preparing the child for future self-support; hence the term *industrial school*, which is coming into more common usage, partially to remove the stigma associated with the word “reform.” A parole system allows normal children to be placed in homes, or to be employed outside the institution when deemed advisable.

Reformatories, whenever possible, are located in the country, where the young people may have the benefit of wholesome out-of-door work. The cottage plan, in which the children are divided into small groups and closely associated with their instructor, is growing in favor.

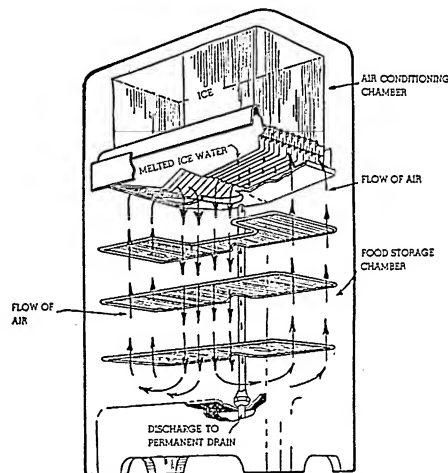
REFRACTION, *re frak' shun*, OF LIGHT. See LIGHT (Refraction of Light).

REFRIGERATION, *re frij ur a' shun*, the process of artificial maintenance within enclosed spaces of temperature lower than that of the surroundings.

Domestic Refrigeration. One of the most common applications of the process of refrigeration is to be found in the small refrigerators designed for use in the home. An insulated space is provided for the temporary storage of perishable food, and a means of maintaining within this space a temperature sufficiently low to retard the growth of the bacteria responsible for the spoilage of food. A temperature between 40° and 50° F. is suitable for this purpose.

Heat from the room constantly leaks into the refrigerated space through the insulated walls, and enters with air or food whenever the doors are opened. In order that the required low temperature may be maintained within the refrigerator, this excess heat must be removed as fast as it enters. Various means are employed for its removal.

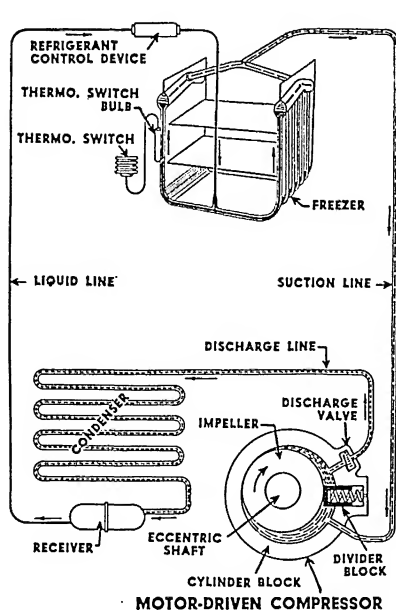
The *ice refrigerator* is a familiar type in the home. A compartment within the insulated space is provided for a cake of ice. The ice,



A MODERN ICE REFRIGERATOR

during the process of melting, absorbs heat, and thus maintains the required low temperature within the food chamber. The heat absorbed is carried away by the resulting water as it drains from the box.

Automatic household refrigerators, because of their convenience, have to a substantial extent replaced the ice box. Within this type of refrigerator, the required low temperature is maintained by the absorption of the excess heat by a liquid refrigerant such as sulphur dioxide, methyl chloride, dichloro-difluoromethane or anhydrous ammonia, all of which



LEGEND

- LOW PRESSURE REFRIGERANT VAPOR
- HIGH PRESSURE REFRIGERANT VAPOR
- LIQUID REFRIGERANT

AN ELECTRIC REFRIGERATOR

Diagram showing cycle of operation and view of the open refrigerator.

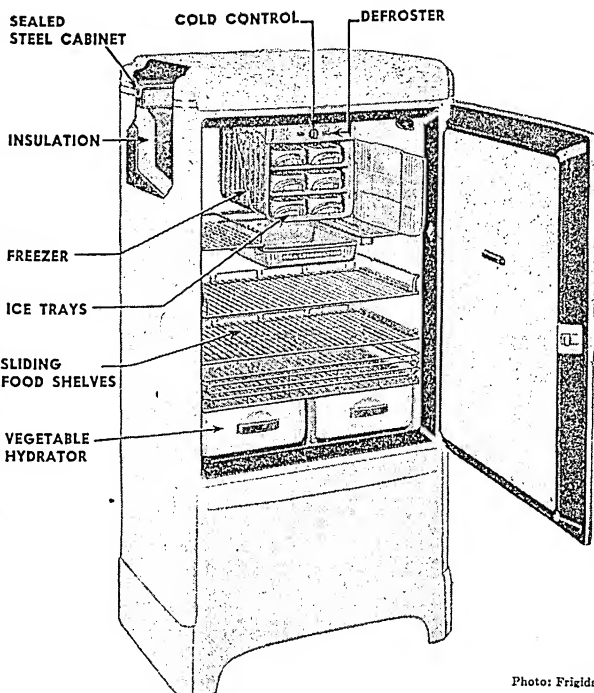


Photo: Frigidaire

boil at low temperatures when subjected to moderately low pressures. The liquid refrigerant is enclosed in a metal container known as the *evaporator*, located permanently within the space to be refrigerated.

When the pressure within the evaporator is reduced by external means, the temperature of the refrigerant is lowered and the excess heat from the food compartment flows in through the metal walls of the evaporator, causing the liquid refrigerant within to evaporate or boil away to a vapor. This vapor, although still at a low temperature, now contains the excess heat absorbed from the interior of the refrigerator, in the form of latent heat.

This vapor with its contained heat is then drawn from the evaporator through connecting piping to a *condensing unit* located outside the food compartment, where it is relieved of its latent heat and reconverted to a liquid.

The compression system of condensation is most commonly employed for this purpose by the domestic units. The small vapor pump or *compressor* used may be of either the reciprocating piston or rotary type. Mechanical energy from an electric motor is commonly utilized to drive the compressor, hence the name *electric refrigeration*.

The necessary reduction of pressure in the evaporator is accomplished by pumping out a sufficient amount of vapor with the suction side of the compressor. This vapor is then

compressed and forced into a condensing coil. The resulting increase in pressure raises its condensing temperature so that the excess heat in the vapor may flow naturally through the walls of the *condenser* into a cooling medium surrounding it. In small systems, this cooling medium is usually room air surrounding extended surfaces of the condenser tubes. In larger units, cooling water is circulated around the condenser walls. The removal by the cooling medium of the heat of compression and the latent heat from the vapor causes it to return to the liquid state. This liquid then flows to a *receiving tank* beneath the condenser, to be readmitted to the evaporator as required.

The temperatures within the food compartment are controlled by valves and switches which automatically regulate the amount of refrigerant evaporated, and start and stop the compressor.

An *absorption system* is employed by a popular type of domestic refrigerator. This system utilizes the varying affinity of water for the refrigerant (anhydrous ammonia) at different temperatures, combined with the heat energy from a gas flame, in maintaining the refrigeration cycle; hence the name *gas refrigeration*.

In this unit, although a uniform pressure exists throughout the system, the *evaporator* contains a small quantity of inert hydrogen gas, the presence of which permits the refrigeration cycle.

erant to operate there under a relatively low partial pressure. This low pressure effect within the evaporator makes possible the necessary low temperature boiling of the liquid ammonia.

The removal of the resulting vapor from the evaporator is accomplished by the absorbing action of a body of relatively cool water on this cold ammonia vapor, these two substances having a strong affinity for each other. This water is contained in a tank known as the *absorber*, directly connected with the evaporator but located outside the refrigerated space.

The resulting strong solution of ammonia water passes from the absorber to another container known as the *generator*. Here external heat from a gas flame drives off hot ammonia vapor from the strong solution. This hot vapor passes to a *condenser* where it is cooled and its latent heat removed, condensing to the liquid state, to return to the evaporator. The hot weak solution from the generator is cooled and returned to the absorber. The food-compartment temperature is controlled by a valve which regulates the amount of gas burned.

A quick-freeze food-storage locker has been made in units small enough for homes. It freezes and preserves meats, fruits, vegetables, and other perishable foods at a temperature of -20°F ., thus making them available for piecemeal consumption at all seasons of the year.

Commercial Refrigeration. Among important applications is that of *cold storage*, which permits dealers to hold large quantities of perishable foods until a convenient time for their sale. The temperatures, ranging from -14° to $+40^{\circ}\text{F}$., are maintained by large refrigerating

plants, the necessary power being furnished by steam engines or electric motors.

Some food products, such as fish, meat, and fruits, are now preserved by a process of *quick freezing*, by which the fresh food is subjected to temperatures as low as -60°F ., and so rapidly frozen that the original texture and flavor is largely maintained.

Note should be made of the use of *dry ice* as a means of maintaining very low temperatures in containers used for transporting ice cream and similar products. This refrigerant is carbon dioxide in its solid state, at a temperature in the neighborhood of -110°F . It receives its name from the property of passing directly to the gaseous state upon the addition of heat.

Another important application of refrigeration is used in the process of *air conditioning* for human comfort. Installations vary from the small units suitable for cooling a single room to complete air conditioning plants for large theaters and public buildings. In all cases, refrigeration is employed for the purpose of properly cooling and dehumidifying the air. As a rule, compression systems employing non-toxic and non-irritating refrigerants are used. In some installations water is the refrigerant, the low temperatures being produced by evaporation under an extremely high vacuum maintained by steam ejectors.

Refrigeration is employed in the manufac-

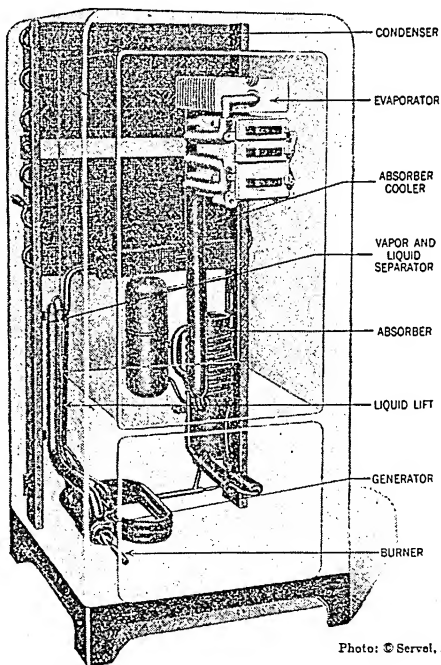
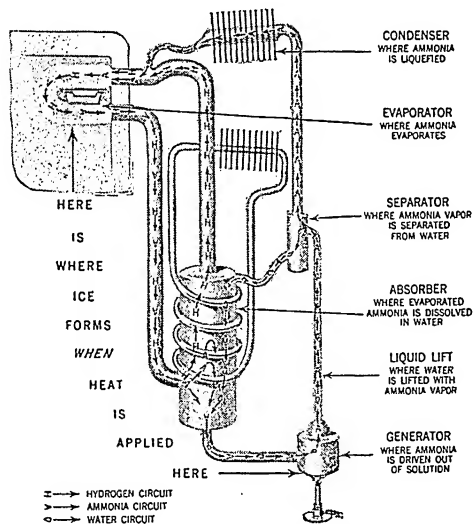


Photo: © Servel, Inc

A GAS REFRIGERATOR

Flow diagram and skeleton view of the operating parts of a modern gas refrigerator, illustrating how refrigeration is accomplished by the application of heat.

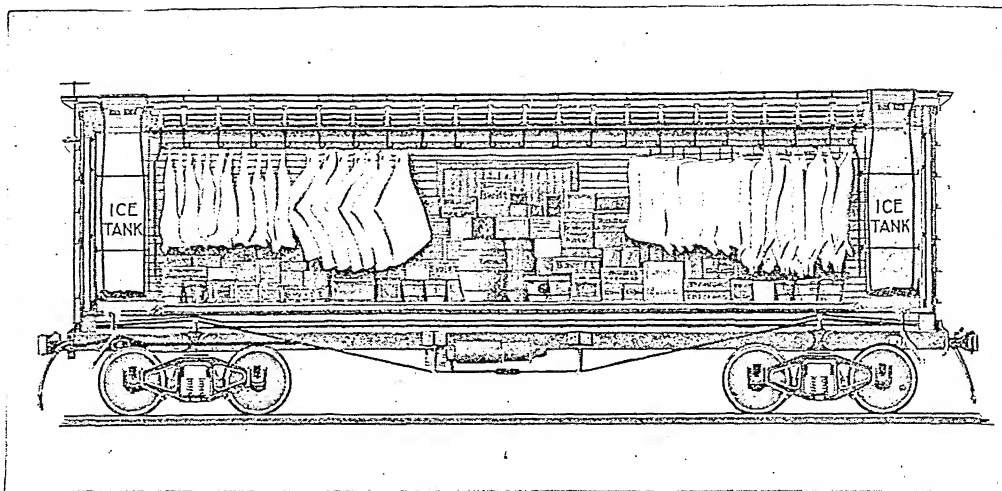


Photo: Swift & Co.

SECTIONAL VIEW OF A MODERN REFRIGERATING CAR

ture of *artificial ice* and *ice cream*, and is also used in many industrial processes such as the refining of lubricating oils and the manufacture of various chemical products.

The *refrigerator car* is widely used in the transportation of perishable foodstuffs. Usually the necessary low temperatures are maintained within especially constructed freight cars (see illustration) by means of ice, or mixtures of ice and salt, although some of these cars have been equipped with small mechanically driven refrigerating plants. D.M.S.

Related Subjects. The reader is referred to:

Air Conditioning	Freezing
Ammonia	Ice
Cold Storage	

REGELATION, *re je la' shun*. If two blocks of ice at about 0° C. or 32° F. (the freezing point of water) are pressed together, the two faces in contact will freeze together. This process is an illustration of *regelation*, or refreezing. It is explained on the theory that pressure lowers the freezing point of water or the melting point of ice. Pressing the two faces together causes the ice to melt at the points in contact, and when the pressure is released, the water thus formed refreezes, uniting the two blocks securely. The ice on skating ponds is more slippery when the temperature is at freezing point than when many degrees colder, because the skate blade, pressing on the ice, causes a film of water to form, and when the skater passes on, the water freezes. It is possible to make a hard snowball under the same conditions, whereas, if the snow is too cold, it cannot be compacted. Glaciers owe their formation partly to the compression, melting, and refreezing of snow. This explains, too, why a glacier will flow (move very slowly) down a mountain slope or valley. See FREEZING; ICE. A.L.F.

REGENERATION. See RADIO COMMUNICATION (Glossary of Radio Terms).

REGENT, *re' jent*, one who assumes the administration of state affairs when the rightful sovereign is under age, absent, or unable to fill the office in person. In hereditary kingdoms, this office is generally held by the nearest relative of the king or queen who is capable of exercising authority.

In English universities, the title of regent is given to doctors and masters who are also instructors. In certain parts of the United States and Canada, the term is given to members of the governing bodies of state colleges and universities.

Derivation. The word is derived from the Latin *regere*, which means *to rule*.

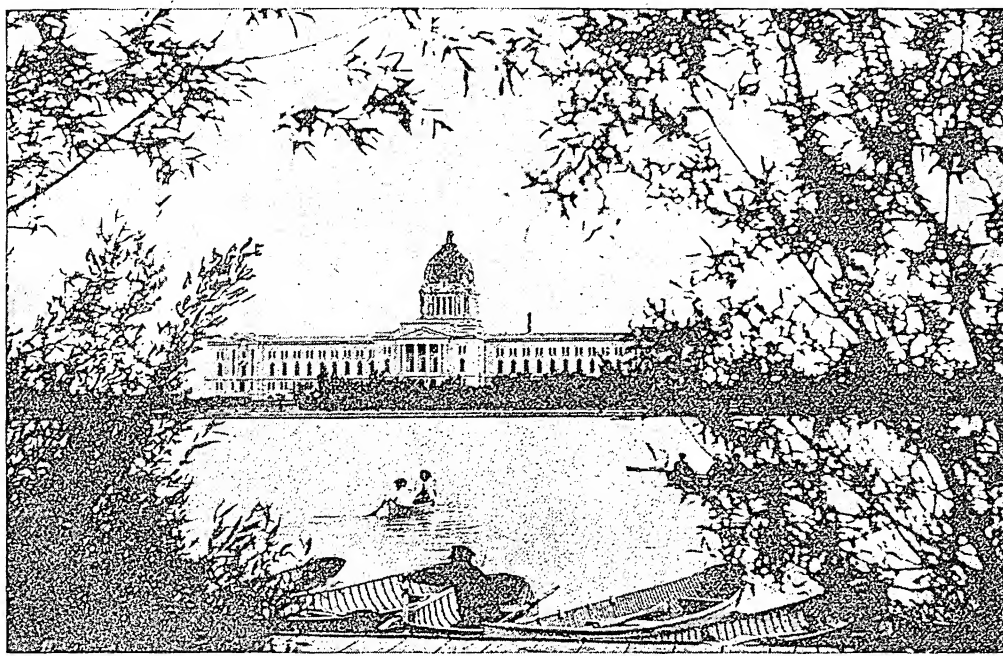
REGENT DIAMOND. See DIAMOND.

REGICIDES, the English officials responsible for the death of Charles I of England. See CHARLES (I, England).

REGIMENT, a body of soldiers forming an administrative unit of an army. In the United States, it comprises from 800 to 3,100 men, and is under the command of a colonel. There are infantry, field artillery, harbor defense, anti-aircraft, horse cavalry, mechanized cavalry, engineer, and medical regiments. Each has certain distinguishing characteristics.

An infantry regiment of the United States Army contains fourteen companies—headquarters, service, and three battalions, each composed of three rifle companies and a heavy-weapons company, equipped with machine guns and mortars. Its total war strength is 2,426 men and 115 officers.

Artillery regiments have twenty-four or thirty-six guns. If its guns are light in caliber and truck-drawn, an artillery regiment would have a wartime strength of 1,187,



PARLIAMENT BUILDING, REGINA

more personnel being required for medium and heavy artillery units.

A British regiment may have two, three, or more battalions, each battalion with full peacetime strength of 3,000 men, divided into four to eight companies.

Related Subjects. The reader is referred to:
 Aircraft Artillery Cavalry
 Army Battalion Infantry

REGIMENTAL COURT-MARTIAL. See COURT-MARTIAL.

REGINA, *re ji' nah*, SASK., the capital of the province and one of the chief commercial centers of Western Canada, is on the main line of the Canadian Pacific and several branches of the Canadian National Railroad. It is 357 miles by rail west of Winnipeg, and about 100 miles north of the United States boundary. Population, 34,432 (1921); 53,209 (1931); 58,245 (1941).

The first settlement on the site of the city was made in May, 1882, and the town site was arranged jointly by the Canadian Pacific Railway Company and the Dominion government. The name Regina was conferred upon the town site by Lord Lorne, when he was Governor-General of Canada. Regina was incorporated as a city in 1903. The city is the western headquarters of the Royal Canadian Mounted Police.

Industry. Regina possesses a unique feature seldom found in large cities. When the city was laid out, a portion of the northern part of the site was set aside for manufactories and warehouses. The city has built and owns railway tracks in this area, by

means of which every factory and warehouse can have freight cars brought to its doors. This convenience has attracted a number of large industrial firms to the city. In this area are found grain elevators, foundries and machine shops, a large oil refinery, steel-wire works, agricultural-implement warehouses, and many other establishments. Regina is one of the most important distributing centers in Western Canada, and has the largest trade in agricultural implements of any city in the Dominion.

Public Buildings. The Parliament building is by far the most imposing structure in the city. It occupies a beautiful site of about 160 acres, south of Wascana Lake. The building is 543 feet long and 227 feet wide, and has a central dome 187 feet high. No more dignified structure, or one better adapted to legislative purposes, can be found in the Dominion. Other buildings worthy of note are the public library, the municipal building, the union station, the normal school, the Collegiate Institute, and the buildings of the Anglican, Regina, and Campion colleges. A.A.

REGISTRATION (OF BIRTHS, MARRIAGES, DISEASES, AND DEATHS). In countries requiring registration, physicians are required to send to the proper recording officer records of births and deaths, and clergymen performing marriage ceremonies are required to send records of the marriages. Marriage licenses are also recorded when issued. Reports of contagious diseases are a part of the records of local boards of health. The objects sought by registration are threefold. It provides a record frequently necessary in courts of law, acts as a wholesome check upon immorality, and provides a basis for sociological study and research. Such records are known as vital statistics (which see).

REGISTRATION AREAS. See VITAL STATISTICS.

REGISTRATION OF VOTERS. See ELECTION (Registration).

REGNAULT, JEAN BAPTISTE. See GRACES, THE THREE.

REGULUS, reg' u lus, MARCUS ATILIUS, a famous Roman general of the third century B.C. In 267 and again in 256, he was elected consul (which see), and during his second term commanded, with his colleague, the fleet sent against the Carthaginians in the First Punic War. Completely victorious on the sea, he landed with his forces, and for a time was so successful that the Carthaginians sued for peace. Regulus demanded unconditional surrender, however, and they resumed the conflict, defeating the Romans in 255 B.C. with great slaughter and taking Regulus prisoner. See PUNIC WARS.

Beyond this point, the story of his life must be looked upon as largely legendary. According to the popular account, he remained in captivity until 250, when he was sent to Rome on parole to make negotiations for peace, promising to return if the terms offered were not accepted by the Romans. Realizing his danger, he yet urged the Roman Senate to continue the war at all costs, and then returned to Carthage to meet his fate, which proved to be death by torture. In revenge for this, Carthaginian prisoners were tortured at Rome; and later-day scholars are somewhat inclined to believe that Roman historians invented the tale about Regulus as an excuse for the barbarities which were perpetrated on these Carthaginian prisoners. The story of Regulus is often cited, however, as an example of true patriotism. See PATRIOTISM.

REHAN, re' an, ADA (1860-1916), an American actress of highest rank for over twenty years. She was born in Ireland, but came to America at the age of six. Her first appearance on the stage was in association with her sister and brother-in-law, Mr. and Mrs. Oliver Doud Byron, and under her original name, ADA CREHAN. This became modified, at first through the mistake of a printer, and then by her own choice, to Ada Rehan. Miss Rehan excelled in comedy rôles, and her personal magnetism, abounding vitality, and charm made her a great favorite.



Photo: Brown Bros.

ADA REHAN

She is said to have played 200 different parts, some of the most famous being those of Lady Teazle in *The School for Scandal*, Rosalind in *As You Like It*, and Katherine in *The Taming of the Shrew*.

REICHSTADT, ryKe' shtaht, NAPOLEON FRANÇOIS CHARLES JOSEPH BONAPARTE, Duke of (1811-1832), called also Napoleon II, was the son of Napoleon and Maria Louisa of Austria. At his baptism, he was given the title of king of Rome, which had been borne by the heirs of the Holy Roman Empire. During the hundred days between Napoleon's escape from Elba and the Battle of Waterloo, Maria Louisa with her young son was at the court of her father, Francis I of Austria, and there the boy remained after the final abdication of his father, while his mother went to Parma. Napoleon had named his son as his successor, but the boy was never recognized by any of the European powers. He was given an excellent education, and showed a decided fondness for military affairs, but was never strong, and died when he was twenty-one years old. Rostand's drama *L'Aiglon* is based on his life. In 1940, the Duke of Reichstadt's remains were taken from the imperial (Hapsburg) crypt in Vienna to the Invalides in Paris and placed alongside his father. This French request of long standing was granted by the German government.

REICHSTAG, ryKs' tahK, was the lower house of the German Parliament, but is now the Nazi Legislative Assembly. The name was retained after the organization of the republican government in 1918. Its members are elected by universal, equal, and secret vote of males and females, and all must be supporters of Adolf Hitler. The Reichstag consists of one deputy for every 60,000 people, elected for four years. It possesses no right of enactment, being permitted to function in an advisory capacity only. See GERMANY (Government).

REID, [THOMAS] MAYNE (1818-1883), a British writer of stories of adventure. He was born at Ballyronney, County Down, Ireland, and was prepared for the Presbyterian ministry, in which his father was serving. The boy's craving for novel experiences, however, caused him to leave home for the United States, where he traveled extensively, and as hunter and trader became acquainted with Indian life. He became a captain in the Mexican War. In his travels and adventures, he met with many exciting incidents which, after his return to Europe, he used in writing his popular stories. Reid made a second visit to America and attempted unsuccessfully to establish in New York the *Onward Magazine*.

Representative Fiction. His novels include *The Rifle Rangers*, *Scalp Hunters*, *The Boy Tar*, *The War Trail*, *White Chief*, and *The Castaways*, all of which have been extremely popular with boys. Many were translated into French and German.

REID, WHITELAW (1837-1912), an American journalist and diplomatist, born in Xenia, O. He was graduated from Miami University at the age of nineteen. Reid's journalistic career began when he became editor of the *Xenia News*. When the War of Secession began, he acted as war correspondent for the *Cincinnati Gazette*, and later as Washington correspondent for the same paper. After the war, he took the position of chief editorial writer for the *New York Tribune*, and in 1872 acquired control of the paper, of which he was part owner when he died.

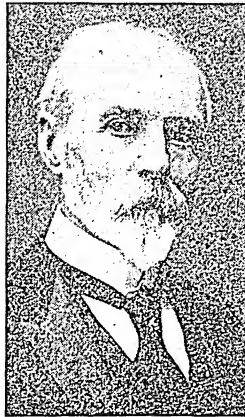


Photo: Brown Bros.

WHITELAW REID

From 1889 to 1892, under President Harrison, Reid was United States minister to France, and at the expiration of his term, was the unsuccessful Republican nominee for Vice-President of the United States. He went as special United States ambassador to Queen Victoria's Diamond Jubilee, and to the coronation of Edward VII, and was a member of the Peace Commission at Paris in 1898. In 1905 President Roosevelt appointed him ambassador to England, a position which he held until his death. England honored him with a state funeral in Westminster Abbey, and his body was conveyed to America on a British warship. Reid received honorary degrees from leading American and English colleges. Notable among his numerous publications is his *Ohio in the War*, an exceedingly valuable state history of the War of Secession.

REIGN OF TERROR, a period of about fifteen months during the French Revolution. The extreme Jacobins were in power, and executions were countless, with little consideration of innocence or guilt of the accused. For further discussion, see **FRENCH REVOLUTION**.

REIMS (formerly spelled **RHEIMS**), *reemz*, or *raNs* (French), a fortified city of Northern France, whose magnificent thirteenth-century cathedral has long made it a place of interest to all lovers of art. Reims, the center of a great vine region, is on the Vesle River, ninety-eight miles northeast of Paris, and is the capital of the department of Marne. After the Battle of the Marne, in September, 1914, the city was not in the territory occupied by the Germans, but it suffered daily bombardment for nearly four years. Immediately following the war, the people put forth a great effort to rebuild the city. Houses and buildings were rapidly replaced, and the popula-

tion had increased to 116,687 by 1936.

After the armistice, signed June 22, 1940, Reims became part of German-occupied France.

Reims is the principal wool market of France and a center of the dyeing and wool-manufacturing industries. It is also an important producer of wine, and manufactures machinery, chemicals, soap, and paper.

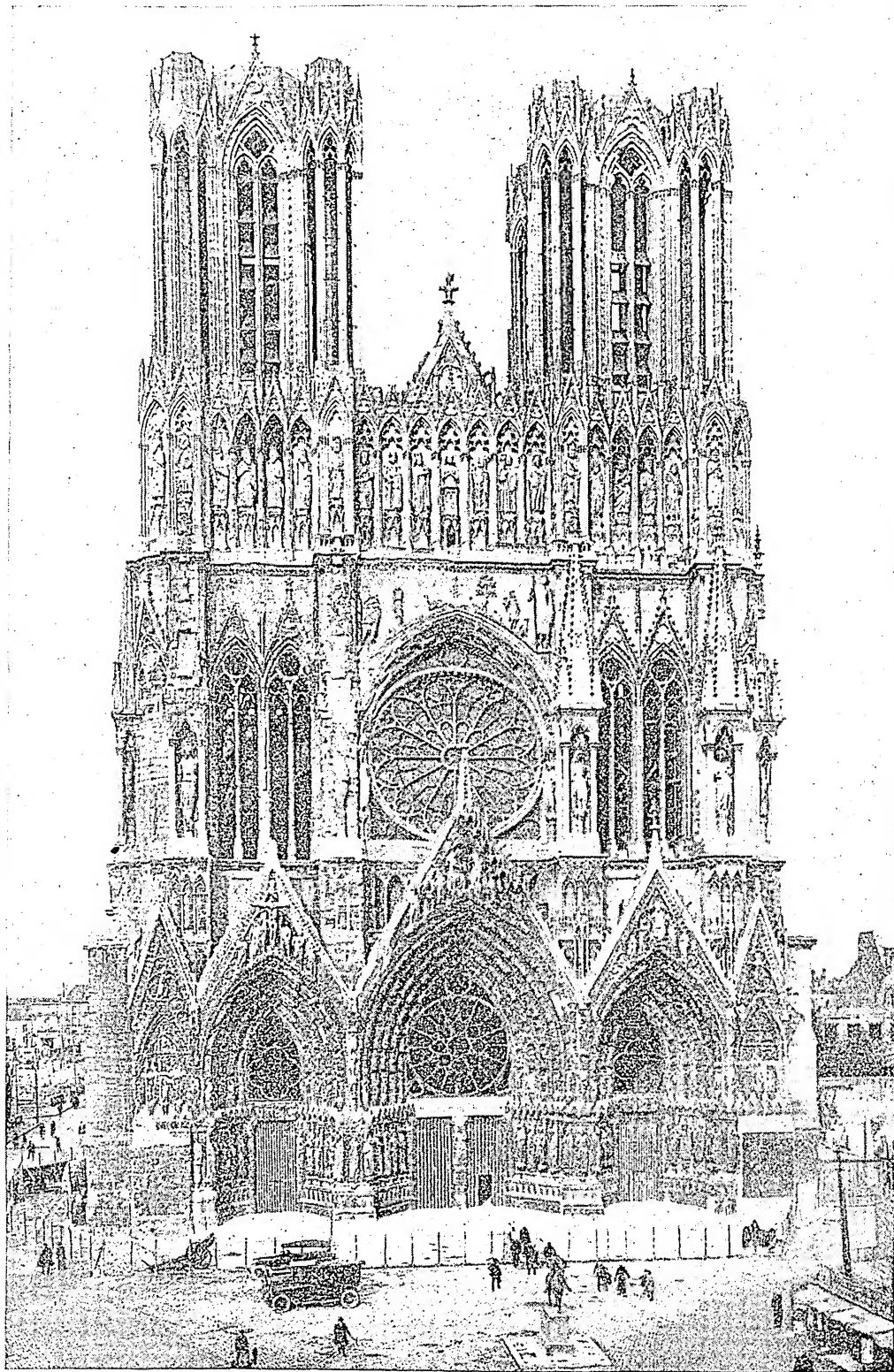
The Cathedral. In spite of the great damage which the Cathedral of Reims suffered during World War I, it remains one of the most beautiful examples of Gothic architecture ever built. Erected in the thirteenth century, this great edifice is representative of the history of France. It was here that for 650 years nearly all the kings of France were crowned, and here that Joan of Arc stood at the coronation of Charles VII in 1429. After World War I, the cathedral stood in a mass of ruins; the façade and portals laden with statues and statuettes, the rose window, and the gallery beneath were destroyed or damaged. The work of restoration, to which John D. Rockefeller, Jr., contributed large sums, was completed in October, 1937, and the Cathedral rededicated in July, 1938. Again in 1940, one tower was damaged by German shells. (See pages 6048,366).

REINCARNATION. See **TRANSMIGRATION OF THE SOUL**.

REINDEER, *rane' deer*, a large deer of the far north, which, under domestication, has become one of man's most valuable possessions in the Arctic regions. In ages past, reindeer ranged over Europe and Asia, but to-day they are found only in the extreme northern parts of those two continents. These deer differ from others in the family in having deeply cleft hoofs and a hairy muzzle, in the shape of the antlers, and in the fact that these are borne by both sexes. The antlers are relatively very large, with slender, unequally branching beams, and are useful in shoveling snow off the animal's winter fare of lichens. Reindeer are further distinguished by a thick body, short legs, and broad feet, which carry them easily over the snow.

If it were not for the reindeer, the people of Lapland would have no means of transportation in their cold and barren country. In these animals they have steeds that can draw their sledges over the snow at the rate of twelve to fifteen miles an hour. The animals have endurance as well as swiftness, for they can travel with a load of from 250 to 300 pounds for hours at a time. To the lowland Laplanders, the reindeer is their horse, sheep, and cow, all in one. The animals furnish the people with clothing and food, and if they live in tents, with shelter. In the summer, reindeer meat is cured, and great quantities of cheese are made from the surplus milk and stored for use through the long winter.

The wild caribou is the American form of reindeer (see **CARIBOU**). This noble animal cannot be domesticated, and the reindeer has therefore been introduced into Alaska by the

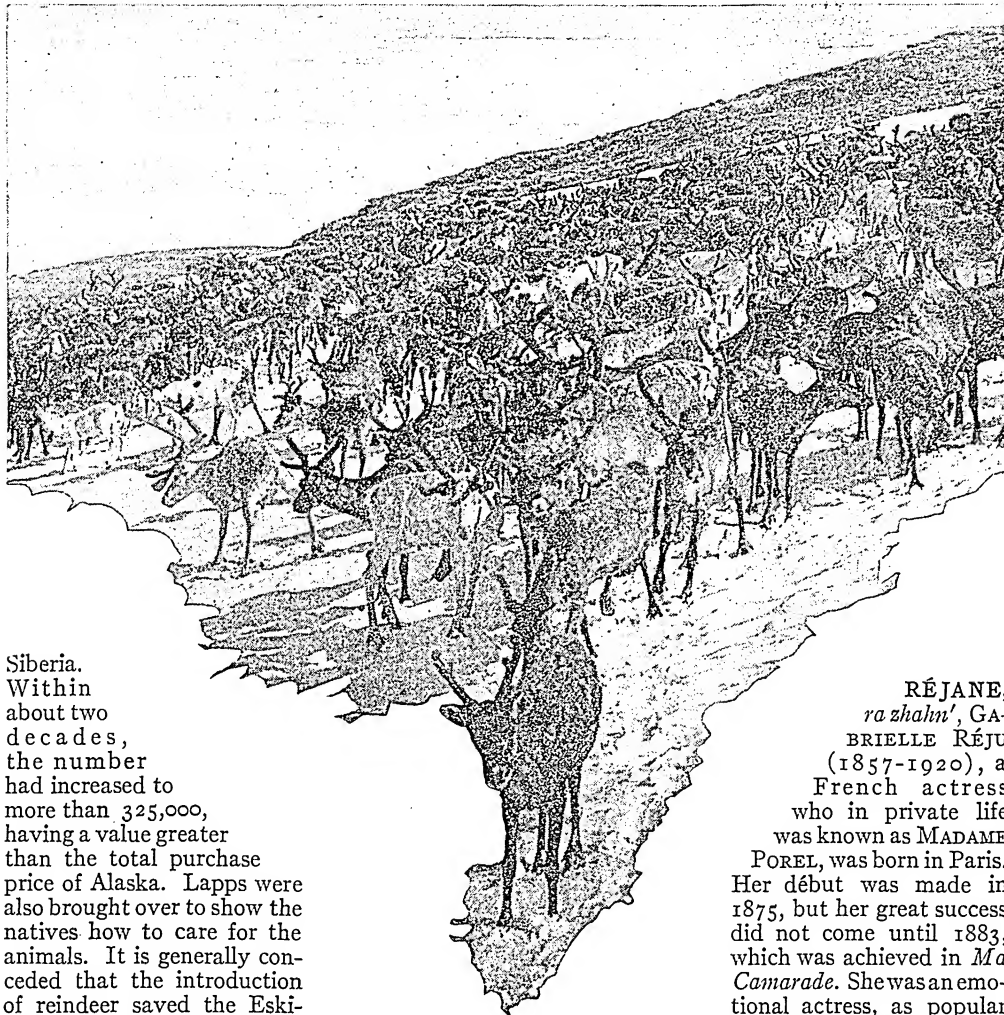


Reims Cathedral. During World War I, this beautiful building was greatly damaged by German gunfire. The attempt at destruction was one of the most cruel blows that could be struck at the French. For 650 years nearly all the kings of France were crowned in it, and here Joan of Arc stood at the coronation of Charles VII, in 1429. The building, restored to its old-time appearance, was damaged again in World War II. See article REIMS, page 6047.

United States government, working through the Bureau of Education. Between 1892 and 1902 there were 1,280 reindeer imported from

REINDEER LAKE. See SASKATCHEWAN (Surface and Drainage).

REINDEER RIVER. See CHURCHILL RIVER.



Siberia. Within about two decades, the number had increased to more than 325,000, having a value greater than the total purchase price of Alaska. Lapps were also brought over to show the natives how to care for the animals. It is generally conceded that the introduction of reindeer saved the Eskimos from starvation and brought them out of a condition of barbarism to a state of pastoral civilization. Domestic reindeer increase in numbers much more rapidly than wild deer, because they are protected by man from their greatest enemies, the wolves. During the winter, when wolves are particularly ravenous, the Eskimos guard their herds from attack day and night.

Reindeer meat from Alaska is now served in restaurants and on dining cars in the Pacific Northwest, and if methods of marketing and transportation are satisfactorily worked out, it may become a staple article of food. See DEER; LAPLAND; ALASKA. W.N.H.

Scientific Name. Reindeer belong to the family Cervidae. The specific name is *Rangifer tarandus*.

Photo: U & U
A HERD OF REINDEER IN NORWAY

REJANE, *ra zhahn'*, GABRIELLE RÉJU (1857-1920), a French actress who in private life was known as MADAME POREL, was born in Paris. Her début was made in 1875, but her great success did not come until 1883, which was achieved in *Ma Camarade*. She was an emotional actress, as popular in America and England as in France. In 1906 she opened the Theatre Réjane in Paris. Among the plays in which she was most successful are *Ma Cousine*, *Amoureuse*, *Lysistrata*, *Madame Sans-Gêne*, and *Zaza*.

RELATIVITY, THEORY OF. See EINSTEIN'S THEORY OF RELATIVITY.

RELAY. See TELEGRAPH.

RELIEF, *re leef'*, a form of sculpture in which the figures stand out from a surface or background. It is to be distinguished from sculpture in the round, in which the objects are not attached to a background, but stand alone. It forms one of the oldest forms of mural decoration. The famous frieze from the Parthenon (see ELGIN MARBLES) is an



Photo: U & U

THIS BOY NEVER SAW FASTER MEANS OF TRANSPORTATION THAN THE REINDEER PROVIDES

example of relief sculpture. There are three important forms of this type of sculpture—low relief (*bas-relief*), high relief (*alto-rilievo*), and semi-relief (*mezzo-rilievo*). These terms are explained under the headings **ALTO-RILIEVO**, **BAS-RELIEF**, and **MEZZO-RILIEVO**. *Hollow relief* is applied to sculpture which has the figures carved below the surface. See **SCULPTURE**; **INTAGLIO**.

RELIEF. See **CHARITY**; also **MAP**; **GEOGRAPHY**.

RELIGION, *re lij' un*. Any attempt to collect or even to summarize all that has been written on the subject of religion would be a hopeless task. In all ages, in all lands, the literature on the subject has been prolific. Innumerable conjectures, theories, and opinions have been put forth in an attempt to understand mankind's inherent beliefs in things supernatural. The marvel of religion is its universality and its multiple forms and details.

Religion, defined, is man's acceptance of the existence of supreme and superhuman powers, usually inherent in beings or gods who are worshipped by the believer. Systems of religion ordinarily acquire ceremonial rites and practices which are strictly adhered to.

The religions of the world are either *monotheistic* (recognizing one Supreme Being), or *polytheistic* (recognizing several gods). A more satisfactory classification is that offered by Jastrow, who makes the following four divisions:

- (1) The religions of savages;
- (2) The religions of primitive culture, such as those of the Indians of Mexico and Peru and those of the Polynesians;
- (3) The religions of advanced culture, which include those of Egypt, Babylonia, Assyria, China, Greece, and Rome;
- (4) The religions coextensive with life, such as Judaism, Buddhism, Mohammedanism, and Christianity.

The origin of religion may be traced only by conjecture—through the study of what religious groups teach about their own beginnings and through the study of beliefs and practices of the savage and primitive peoples of today. One theory holds that religion was revealed originally by the Supreme Creator and that man has for generations fallen away from his first ideal. Another holds that religion has evolved from rude beginnings to complex systems. One of the essentials of primitive religion is animism, which attributes conscious life to the

RELIGIONS OF THE WORLD

Continental Distribution

	NORTH AMERICA	SOUTH AMERICA	EUROPE	ASIA	AFRICA	OCEANIA
Christians						
Greek Catholics (Orthodox).....	1,208,157	.....	112,447,669	8,106,071	5,868,089	.....
Roman Catholics.....	47,056,724	60,836,143	203,944,823	9,213,413	6,866,072	10,468,764
Protestants.....	38,998,467	657,481	81,767,054	4,422,777	2,782,864	6,372,250
Total Christians.....	87,263,348	61,493,624	398,159,546	21,742,261	15,517,025	16,841,014
Non-Christians						
Jews.....	4,409,712	266,958	9,372,666	572,930	542,869	26,054
Mohammedans.....	1,400	.....	5,672,225	138,299,144	55,538,211	21,467,868
Animists.....	50,000	.....	.....	45,000,000	75,301,961	100,000
Buddhists.....	180,000	.....	.....	150,000,000	.....	.....
Confucianists, Taoists..	600,000	.....	.....	350,000,000	.....	.....
Hindus.....	150,000	.....	.....	230,000,000	.....	.....
Shintoists.....	.....	.....	.....	25,000,000	.....	.....
Others.....	78,040,577	22,134,607	137,981,585	150,607,018	1,000,000	46,768,506
Total Non-Christians	83,431,689	22,401,565	153,026,476	1,095,479,092	132,383,041	68,363,328
Grand Total.....	170,695,037	83,895,189	551,186,022	1,117,221,353	147,900,066	85,204,342

sun, moon, trees, rocks, springs, animals, and manifestations of nature which are mysterious. Primitive peoples often personified these objects, and imagined them to have a soul like their own. They believed their gods had power and control over their daily lives, and that it was to their advantage to placate them—an attitude which came to be worship.

Worship of spirits, especially those of ancestors, is thought to have originated in dreams about deceased relatives and friends and in other mysterious visions. Magical rites and ceremonies springing up and becoming complicated, an intermediary was needed between the people and their object of worship; hence, the priest came into being to perform this service. The medicine man, the prophet, and the inspired or religiously-inclined believer are all in this group. Totemism and magic, being mysterious to the masses, frequently become involved and confused with religious rites and beliefs.

It is pointed out by students of the theory of evolved religion that to primitive peoples each deity was exclusive with the tribe, but as tribes became nations, religions and gods became national, the individual becoming farther removed from his god or gods and the rites and taboos becoming more extensive and more formal. Hierarchies of priests became necessary to perform these rites and to serve as guardians of the morals of the people. Thus there developed the mythological religions of the Egyptians, Greeks and Romans, and other peoples of advanced culture.

The religions coextensive with life are the ones that have the most vital effect in the life of the individual. That is, they demand of their followers the practical application

Totals for the World

RELIGION	NUMBER	PER CENT
Christians		
Greek Catholics (Orthodox).....	127,629,986	6.9
Roman Catholics.....	338,385,939	15.7
Protestants.....	135,000,893	6.2
Total Christians.....	601,016,818	27.8
Non-Christians		
Jews.....	15,102,080	0.7
Mohammedans.....	220,978,848	10.2
Animists.....	120,451,961	5.5
Buddhists.....	150,180,000	6.9
Confucianists, Taoists..	350,600,000	16.3
Hindus.....	230,150,000	10.7
Shintoists.....	25,000,000	1.2
Others.....	442,532,293	20.7
Total Non-Christians..	1,555,085,191	72.2
Grand Total.....	2,156,102,009	100.0

of certain lofty ethical standards. They are more spiritual than the religions of the first three groups, and in their forms of worship superstition is of less importance. Considering them from a racial standpoint, it is interesting to note that the nations which have most influenced human history are those in which Christianity is the prevailing religion.

The historical and scientific study of religion, called *comparative religion*, dates from the nineteenth century.

G.L.K. and O.M.N.

Derivation. The term *religion* is derived from the Latin *religio*. There are two theories as to the derivation of the Latin term, some holding that it comes from a verb meaning to *gather together*, and others that it is derived from a verb meaning to *bind*. The latter think that their interpretation is correct because religion binds one to certain obligations.

Related Subjects. The articles in these volumes relating to religion are numerous. The reader is referred to the following:

Abbot	Gentiles
Adventists	Ghebers
African Methodist Churches	God
Agnostic	Greek Church
Allah	Hadj
Alpha and Omega	Heaven
Altar	Hegira
Amana	Hell
Amen	Heresy
Anabaptists	Hermits
Ancestor Worship	Hierarchy
Angel	High Priest
Anglican Church	Holy Water
Animal Worship	Holy Week
Apostles	Huguenots
Archangel	Idol
Archbishop	Immortality
Atheism	Incense
Atonement	Index Expurgatorius
Ave Maria	Indulgence
Babism	Innocents, Feast of
Baptism	Holy
Baptists	Islam
Benedictines	Jehovah
Bishop	Jesuits
Brahma	Jesus Christ
Brahmanism	Jews
Brethren, Church of the	Koran
Breviary	Lamaism
Buddhism	Latter Day Saints
Bull	Lent
Canonization	Litany
Canon Law	Liturgy
Capuchins	Lutherans
Cardinal	Magi
Carthusians	Magnificat
Cathedral	Martyr
Censer	Mass
Chaplain	Mendicant Orders
Charity, Sisters of	Mennonites
Christian Endeavor,	Mercy, Sisters of
Young People's	Messiah
Society of	Methodists
Christianity	Missal
Christian Science	Missions and Mission-
Christmas	aries
Church	Mohammedanism
Church of England	Monasticism
Conclave	Monk
Concordat	Moravian Brethren
Congregational Church	Mormons
Counter-Reformation	Mysticism
Covenanters	Nature Worship
Creed	Nonconformists
Cross	Nun
Deaconess	Nuncio
Dervish	Pantheism
Devil	Parsees
Devil Worship	Paulists
Disciples of Christ	Polytheism
Dominicans	Pope
Druids	Predestination
Dukhobors	Presbyterian Church
Easter	Priest
Epiphany	Prophet
Episcopal Church	Protestant
Epworth League	Purgatory
Eucharist	Quakers
Evangelical Alliance	Rabbi
Fasts and Fasting	Reformed Church
Fatalism	Religious Liberty
Fire Worship	Resurrection
Foreordination	Rogation Days
Franciscans	Roman Catholic
Free Methodists	Church
Freethinker	Rosary
	Sacrament

Sacred College
Sacrifice
Salvation Army, The
Shakers
Shinto
Sunday Schools
Supernaturalism
Swedenborgians
Synagogue
Talmud
Taoism
Theosophy

Thirty-nine Articles
Trappists
Trinity
Unction
Unitarians
Universalists
Ursulines
Vatican Council
Vicar
Volunteers of America
Wesleyan Methodists
Zionist Movement

The lives of the following religious leaders will also be of interest in this connection. See also lists of clergymen and churchmen under PROTESTANT and ROMAN CATHOLIC CHURCH.

Blavatsky, Helena P.	Luther, Martin
Booth	Melanchthon, Philipp
Calvin, John	Mohammed
Confucius	Moody, Dwight
Dowie, John A.	Lyman
Eck, Johann Maier von	Smith, Joseph
Eddy, Mary Baker	Sunday, William A.
Fox, George	Wesley, John
Huss, John	Williams, Roger
Hutchinson, Anne	Young, Brigham
Knox, John	Zoroaster
Loyola, Saint Ignatius of	Zwingli, Ulrich

RELIGIOUS, *re lij' us*, LIBERTY, the right of a person to adopt and profess opinions on religious subjects, and to worship or refrain from worship, according to desire or to the dictates of conscience, without external control. The idea of religious liberty was wholly lacking among the nations of antiquity, and the religion of the individual was always subject to the will of the ruler. The Roman Empire had its State religion, to which every subject was supposed to conform, but little official attention was paid to other beliefs as long as they did not interfere with the State religion, or with the established institutions of government. Christianity, however, was put under the ban because of its teachings in regard to the brotherhood of man, the fatherhood of God, and the divinity of Christ.

During the early centuries of the Christian Era, there were only spasmodic attempts at persecutions, and not until the time of Diocletian was there a systematic effort to stamp out the Christian religion. By his order, Christian assemblies were forbidden, churches were destroyed, books were burned, and all who refused to adopt the State religion were made to suffer. Under Galerius, toleration was granted to the Christians, with the proviso that the religion of the State was to be respected. The Emperor Constantine was later converted to Christianity, and he issued an edict in 313 which granted full toleration of religious worship to all persons. This was soon followed by an order making Christianity the religion of the State and prohibiting heathen worship. During the Middle Ages, the teachings of the Roman Catholic Church came to be so fully accepted in all countries that the question of religious liberty did not arise. Later, when dis-

senters appeared, they were opposed. When entire states revolted from their allegiance to the Pope, as England under Henry VIII, they generally set up State churches, to which all subjects were compelled to conform.

The Reformation with its new thought did not in any way bring religious liberty, for each sovereign insisted upon unity of religious faith as necessary for the unity of the State. Sometimes, when one sovereign succeeded another of different faith, the religion of the State was changed to conform to that of the sovereign, and all dissenters were persecuted. Henry VIII persecuted all who refused to recognize the State Church, whether they favored the Roman Catholic Church, or whether they wanted to be even more Protestant than the State Church. Then, when Mary came to the throne, Catholicism was for a time reestablished, and persecutions were carried on against all who refused to acknowledge the Roman faith.

In the United States. The Pilgrims left England in order to find a place where they might worship as they chose, but even they carried with them the prevailing ideas of religious intolerance. In all of New England except Rhode Island, dissent from the established order of Church worship and belief was looked upon as sedition against the State and sin against God. Baptists, Jesuits, and Catholic priests were imprisoned or banished, and several Quakers were publicly hanged on Boston Common. In the Catholic colony of Maryland, religious toleration existed for a time to all except Jews, Mohammedans, and other non-Christians; the Church of England was established in Georgia just before the Revolution. Only in Pennsylvania, Delaware, and Rhode Island were there no State churches.

The United States Constitution declares that "No religious test shall ever be required as a qualification to any office or public trust under the United States." There was considerable objection to the Constitution in some of the states, because non-Christian sects were not excluded from holding office, and also because Congress was not empowered to establish a national Church. Nevertheless, the First Amendment to the Constitution provides that "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." The states, however, were allowed to establish State churches, or to leave the matter alone, as they pleased.

While almost complete independence in religion now exists, this liberty, like any other, may be abused. Thus religious liberty cannot be extended to include acts which are considered inconsistent with the peace and safety of the state. On this ground, the courts upheld the United States law prohibiting the practice of polygamy. Religious liberty has developed in

America as it never existed before in any land, and its success in the United States has exerted a powerful influence over other countries.

In Other Countries. While England still has its Established Church, yet all religious tests for holding office have been abolished, except in respect to the Crown; the sovereign must be an adherent of the Church of England. The same freedom exists in all English dominions. In France, no religious denomination receives any aid from the State; in Germany, religion is state-supervised. In most of the Latin countries, particularly Italy, Spain, and Portugal, Roman Catholicism dominates the thought of the people, but all religions are tolerated.

Related Subjects. The reader is referred in these volumes to the following articles:

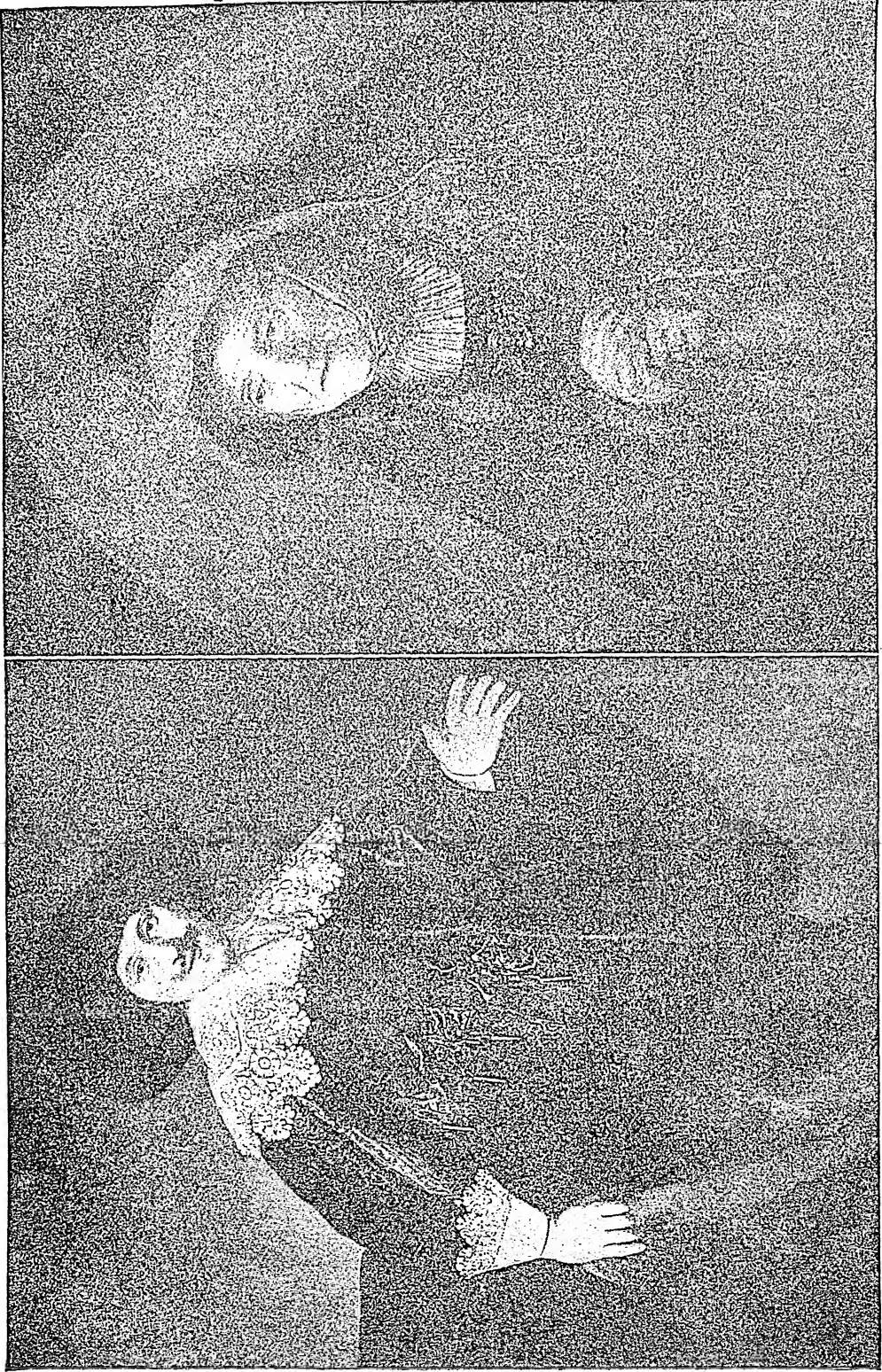
Diocletian	Mary (I, England)
Henry (VIII, England)	Reformation
Ku-Klux Klan	Roman Catholic Church

REMBRANDT, *rem' brant* (1606-1669), the representative painter of the Golden Age of Dutch Art, and one of the greatest masters



REMBRANDT

of portraiture that ever lived. His power of expressing mass and his rendering of detail remain unsurpassed. He was a real draftsman, which cannot be said of many famous painters. Rembrandt was born at Leyden, and his name in full was REMBRANDT HARMENSZ VAN RIJN. He began his career as an etcher. About 1631 he removed to Amsterdam, where he spent the rest of his life. There, in 1634, he married the beautiful Saskia van Uylenborch, of whom he painted numerous portraits. In the gallery at Dresden may be



Examples of the Art of Rembrandt. At the left is a reproduction of a painting which bears the title, "Portrait of a Young Man Rising from His Chair." At the right, a painting of Rembrandt's mother is reproduced. The original of the former is in the collection of C. P. Taft of Cincinnati, O.; the latter is in the Vienna (Austria) Museum.

seen one of the finest of these, together with a beautiful canvas of both, entitled *The Wedding Breakfast*. The artist was exceedingly fond of painting his own likeness and likenesses of the members of his family. Saskia was the inspiration of many of his finest achievements, and after her death, in 1642, his good fortune waned. Though he had enjoyed a high reputation and been looked upon as the most popular portraitist of the day, he died in poverty and obscurity.

Two Celebrated Canvases. "Rembrandts" are to be found in numerous galleries of Europe and America. The artist's first great masterpiece, *The Anatomy Lecture*, painted in 1632, is at The Hague; his most celebrated work, the so-called *Night Watch*, is in the Royal Museum at Amsterdam, and was painted the year his wife died (1642). Many men in Rembrandt's time, and earlier, had been commissioned to paint portrait groups, and in every case the result had been a mere conventional grouping; but Rembrandt, engaged to paint the portraits of the musketeers of Amsterdam, made of his picture this "embodiment of that civic heroism which had lately brought about Dutch independence." It is a strange mingling of fact and poetry, realism and fancy, in true Rembrandt style; but it is *alive*. It was long called *The Night Watch*, and the title fitted well the dingy, smoke-blackened canvas which hung in the Amsterdam Town Hall. But in 1889 the picture was cleaned and brightened, and emerged not as a night watch, but as a full daylight scene in the master's happiest style.

Of almost equal fame is *The Syndics*, in the same museum. The Metropolitan Museum, in New York, has a likeness of his son Titus, the celebrated *Old Woman Culling Her Nails*, *The Auctioneer*, and several others; in the Art Institute, Chicago, is his admired *Girl at a Window*. There are also many noted "Rembrandts" in private collections in America. Probably his best-known landscape painting is *The Mill*, a treasure of the Widener collection in Philadelphia. Rembrandt also left many fine examples of religious painting, notably the *Pilgrims at Emmaus* (Louvre). His etchings are represented by *Descent from the Cross*, *Christ Healing the Sick*, and *Burgomaster Jan Six*. In all, there are about 280 canvases and 320 etchings of the master extant, representing the years between 1625 and 1668.

REMEDIAL, *rem e' dih al*, LAW. See LAW.

REMÉNYI, *reh' mayn ye*, EDUARD (1830-1898), a famous Hungarian violinist and writer. He received his musical education at the Conservatory of Vienna, but was compelled to leave Austria because of his prominence in the insurrection against Austrian rule. He went to the United States in 1849, but in 1853 returned to Europe, and subsequently was appointed solo violinist to Queen Victoria of England. To him, music was a vital thing, not a mere accomplishment. As he wrote in one of his essays, "It is my life, my blood, my

everything," and his playing revealed that these words were true. However, Reményi's enthusiasm led to exaggeration and eccentricities which proved a bar to the highest excellence.

REMINGTON, FREDERIC (1861-1909), an American painter, sculptor, and writer, who successfully portrayed the life and atmosphere of the great West of pioneer days. He was born at Canton, N. Y., and received his art training in New York City. Ill health caused him to go West, and there he saw service with the United States troops against the Indians. The inspiration for his work came from his contact with the Western country, where he herded with cowboys, shot antelope and buffalo, and camped with the Indians. The beauty of the Western plains, with their marvelous desert colors and atmosphere of mystery, made an indelible impression upon him, which his canvases reveal in a striking way.



Photo: Brown Bros.

FREDERIC REMINGTON

Remington began his artistic career as an illustrator of stories of Western life; later, he painted not only Indians and cowboys, but miners as well, each character in his natural environment. He also became interested in bronze work, and his two statuettes, *Broncho Buster* and *Wounded Bunkie*, were executed with the skill and feeling which characterized his paintings. Both of these are now in the Metropolitan Museum in New York. That institution also possesses one of his best paintings—*Cavalry Charge on the Southern Plains*. He wrote and illustrated *Pony Tracks*, *Crooked Trails*, and *The Way of an Indian*.

REMUS, twin brother of Romulus (which see).

RENAISSANCE, *ren eh sahNs'*. Following the Dark Ages, in which all the learning and culture of the ancient Greeks had been forgotten, when people followed blindly the ideas and dictates of an intellectual master and made no efforts to think for themselves, and when thoughts of a future life eclipsed all desire for the progress or improvement of the present, came a period of awakening and a new consciousness of things intellectual and cultural. So changed became the ideas and interests of the people that there was said to be an intellectual rebirth. This era has been called the *Renaissance*, which is the French word for *new birth*. It represented an escape from traditional ideas, and had much to do with bringing about the dawn of Protestantism.

It has become customary to attempt to fix a definite period for this Renaissance, some authorities stating that it was due to the influx of Greek manuscripts and scholars into Europe after the fall of Constantinople in 1453. Though the capture of the Eastern seat of learning by the Turks must naturally have had the effect of driving westward much culture and learning, the Renaissance was really the result of a gradual process of education which had been extending over the west of Europe for a century previously. Some would go as far back as Dante (1265-1321) to determine the date of its conception.

The Middle Ages are disparagingly spoken of as days of dark barbarity and ignorance, but such was not entirely the case. Those days had a culture of their own; the change of method of thought in art, literature, and science was in great measure due to the increasing number of students who went East to study, after having had their intellectual curiosity awakened in the West. Medieval learning in Europe was almost entirely confined to the clergy, and had been chiefly devoted to solving and explaining religious mysteries. The influx of more advanced learning from the East broadened Western minds, opened up new channels, and gave to study a more critical, analytical turn. Gradually, the conventional, narrow rules governing the study of the sciences were overthrown. An era of inquiry was ushered in. Men's minds were ready to receive new impressions; a new impetus was given, and a great desire for learning was created. This learning was sought in a freer, broader spirit, unrestricted by the narrow limits previously imposed by the clergy and conventionality.

To enumerate the effects of the Renaissance is to discuss the history of art, literature, science, philosophy, poetry, even religion. In every field of human activity there existed a new spirit. Men were no longer content to accept the answers of tradition to their questions. The intellectual life of the world had run in one groove for centuries; it was now to return to the many-grooved life of the ancient Greeks and Romans, and there find inspiration for new paths. One of the vital elements in the great movement was the perception of man's dignity as a reasoning, willing, and knowing being. The new spirit may be said to have humanized knowledge.

In Italy, where the Renaissance first reached its bloom, the scholars were soon fascinated by study as an end; "art for art's sake" was really the unexpressed motto of the Italians. In the northern countries, Germany, the Netherlands, England, and even in France, the Renaissance developed more naturally. Where, in Italy, the New Learning gradually became affectation, in the north it became a thing of

power. Particularly in Germany, the Renaissance became the religious Reformation. Among its leaders were Erasmus, Melancthon, and Van Hutten. In France and England, as in Germany, the revival of learning was intimately connected with the Reformation. In these countries there was instilled a new feeling for beauty and truth, and there was a period of glory for the arts and literature, but the Renaissance spirit gradually became what we would to-day call a practical one, rather than purely esthetic. In England, Wycliffe and Chaucer were forerunners of the English Renaissance, although the great Elizabethans—Spenser, Shakespeare, and Bacon—were the best representatives.

Related Subjects. The reader is referred to:

Boccaccio, Giovanni	Middle Ages
Erasmus, Desiderius	More, Sir Thomas
Furniture (The Renaissance)	Petrarch, Francesco
Medici	Reformation, The
Melancthon, Philipp	Wycliffe, John

RENAL ARTERY. See URINE; KIDNEYS.

RENAL CALYX. See KIDNEYS, illustration.

RENAL VEIN. See KIDNEYS.

RENAN, *reh nahN'*, ERNEST (1823-1892), a French philologist and historian, known to general readers chiefly for his *Life of Jesus*. He was born at Tréguier, in Brittany, and after the death of his father, in 1828, was dependent for guidance, and in part for support, upon his sister Henriette, whose influence in his life cannot be overestimated. At the ecclesiastical school in Tréguier, and later at Saint Sulpice in Paris, he was trained for the priesthood, but he found that he had lost his belief in the doctrines of the Church, and he left the Seminary and began to teach. A *General History of Semitic Languages* met with such favor that he was sent by the Academy to study in Italy and later in Syria, where his interest in languages was confirmed.



Photo: Brown Bros.

ERNEST RENAN

In 1862, after his return from Syria, Renan was given the chair of Hebrew in the Collège de France, but the unorthodox views which he expressed in his very first lecture led to his dismissal from this post, which was not restored to him until 1871. In 1878 he was elected to the French Academy, and before his death, all the honors which France could pay to a scholar were given to him, including the dignities of Grand Officer of the Legion of Honor and administrator of the Collège de France.

Renan's Other Books. The *Life of Jesus* appeared in 1863, and was followed by other volumes on the origin of Christianity and the history of the Church. These included *The Apostles*, *Saint Paul*, *Antichrist*, *The Christian Church*, and *Marcus Aurelius*. A volume on *Memories of Childhood and Youth* gives attractive pictures of his early years. R.T.H.

RENI, *ra' ne*, GUIDO. See GUIDO RENI.

RENNES, *ren*. See FRANCE (Interesting Cities).

RENNIN. See FERMENTATION; STOMACH; DIGESTION.

RENO, *re' no*, NEV. See NEVADA (back of map).

RENSSELAER, *ren' sehl ur*. MARTHA VAN. See WOMEN, TWELVE GREATEST AMERICAN.

RENSSELAER, N. Y. See NEW YORK (back of map).

RENSSELAER POLYTECHNIC INSTITUTE. See NEW YORK (Education).

RENT, in everyday speech, signifies a payment made by one person to another for the loan or lease of land or buildings, or other durable property. But in the science of economics, the word has quite a different meaning, as the following paragraphs show.

Rent in Economics. In economics, the term rent has a technical meaning. Assume that you apply a certain number of units of labor and capital (machines, tools, etc.) to land of varying degrees of fertility. The land that is more fertile will yield a larger crop per applied unit of labor and capital than will the less fertile land. In this case, the excess of the product obtained on the more fertile land, over and above the product obtained on the marginal land, is regarded as the rent. By marginal land is meant land which just repays the expenses of cultivation; were the price of the product grown on this land to fall, or the cost of producing it to increase, this land would cease to be cultivated.

It should be noted that economic rent is derived from land, and not from the buildings that may be erected upon it. Buildings, in so far as they are used in production, are capital; and the return upon them is called interest (see INTEREST). If a farm which you rent has buildings upon it, part of the money rent that you pay is really interest on capital. In your dealings with the landlord, you make no distinction between a payment for the land and a payment for the buildings, but in economic reasoning, this distinction must be made, because the laws which govern rent and those which govern interest are not the same.

Why Rent Exists, and How Its Amount Is Determined. If land were unlimited in supply and of uniform quality, there would be no rent. There would be no surplus product over and above the product obtained on the marginal land, for there would be no marginal land under cultivation. Accordingly, no one would make

any money payment for the use of the superior land. But since land is of varying fertility and desirability, some land yields a larger product than other land, and those who own the superior land can charge a rental for its use. The rental, roughly stated, equals the probable selling price of the surplus product obtained on the land, over and above the product obtained on marginal land.

An understanding of the similar principles of rent will be facilitated if we illustrate by the settling of a small island. The first man to arrive takes a part of the most fertile land. The second man to arrive finds that land is available which is equally good, from both the standpoints of fertility and location. Accordingly, there is as yet no economic rent and no money payment. As more settlers arrive, however, the best land is all taken up, and inferior land has to be resorted to. Labor and capital applied to the inferior land does not result in the production of so many bushels per acre. Suppose that labor and capital applied on the poorest land that is worth cultivating (the marginal land) yield ten bushels per acre, whereas the same amount of labor and capital applied to the best land yield thirty bushels per acre. Under these conditions, the best land yields a rent (surplus product) of twenty bushels per acre, and the owner, if wheat sells for \$1.00 per bushel, could demand a money rent of \$20 per acre for the use of his land. This explains how rent in the economic sense is translated into rent in the ordinary business sense.

The Selling Price of Land. The selling price of land is arrived at by capitalizing, at the current rate of interest, the fixed income which is derived from it. If the land will yield its owner an annual income of \$20 per acre, the land would be worth, assuming the rate of interest to be five per cent, the sum of \$400 (\$400 at five per cent equals \$20). The selling price varies inversely to the rate of interest. If the prevailing rate of interest for investments of equal security is only four per cent, the land would be worth \$500 (\$500 at four per cent equals \$20).

In practice, the actual price at which land will sell is not so easily determined, because account has to be taken of the conditions that are likely to prevail in the future. In the days to come, the prices of agricultural produce may advance or recede; interest rates may move up or down; settlers may come to the island and increase rental values; railroads may be built which will decrease the difference in desirability of near-by and far-off lands. Many such possibilities must be considered by both purchaser and seller. This is one reason why a knowledge of the principles of rent may prove an extremely valuable asset to any man or woman.

To Whom Does Rent Belong? Because rent depends on the presence of people and so, in a sense, is created by the community, there are many who believe that private ownership of land or appropriation of its rents is unjust. The claim, of course, meets strenuous opposition. Interesting information on this point will be found under the heading SINGLE TAX, and the story of the remarkable experiments of one government, in the article NEW ZEALAND.

E.J.

RENUNCIATION OF WAR, GENERAL TREATY FOR, also known as the PARIS PEACE PACT and the KELLOGG-BRIAND PACT. This multipartite treaty, signed in 1928, and ratified or adhered to by sixty-four states, has sometimes been considered as an American substitute for the League of Nations. The pact was negotiated partly in response to a peace movement in the United States demanding the "outlawry of war." In 1922, Senator William E. Borah offered a resolution in the United States Senate urging the negotiation of a treaty with all nations to outlaw war. The resolution was not adopted. On April 6, 1927, on the anniversary of American entrance into the World War, Aristide Briand, the French Minister of Foreign Affairs, proposed that France would be willing to enter into an agreement with the United States for the renunciation of war as an instrument of national policy toward each other. Briand's action was taken at the prompting of an American scholar, James T. Shotwell.

Reluctantly, under pressure from several Senators, in December 1927, Secretary of State Frank B. Kellogg began negotiations and proposed, in place of a bipartite treaty, a multipartite treaty under which all states would renounce war. France accepted this alteration. Thereupon, Great Britain, Germany, Italy, and Japan were invited to join the negotiations. Later, were included the British dominions, India, and the "Locarno Powers," namely Belgium, Czechoslovakia, and Poland (see LOCARNO PACTS). These states accepted the text of a short treaty reading:

Article 1. The High Contracting Parties solemnly declare in the names of their respective peoples that they condemn recourse to war for the solution of international controversies, and renounce it as an instrument of national policy in their relations with one another.

Article 2. The High Contracting Parties agree that the settlement or solution of all disputes or conflicts of whatever nature or of whatever origin they may be, which may arise among them, shall never be sought except by pacific means.

In a solemn ceremony, at the French Foreign Office, on August 27, 1928, the Pact was signed by Secretary Kellogg and Minister Briand and by representatives of the thirteen other signatory states. Eventually, forty-nine states

adhered to the Pact, one of these states being Soviet Russia whose government had not yet been recognized by the United States. Today, the Pact is a treaty obligation binding upon sixty-four states. It is the most widely applicable of all the international peace agreements.

The interpretation of the Pact is a matter of dispute. During the negotiations, France proposed that the renunciation be limited to wars of aggression and that legitimate self defense and the obligations of states under the Covenant of the League of Nations and the Locarno Pacts be exempted. Secretary Kellogg refused to permit these exceptions in the text of the treaty. But League states could not consistently permit the new Pact to weaken the peace system of Europe. Accordingly, the exchange of notes during the negotiations clearly registered the view of the signatory powers to the effect that they interpreted the Pact as excepting both wars of self defense and the use of force to carry out obligations of the Covenant. Senator Borah added to the confusion over interpretation, when the ratification of the treaty was before the Senate, by claiming the Monroe Doctrine to be a part of American national defense.

The Paris Peace Pact has been praised as an idealistic endeavor to promote peace. Certainly, it expressed a noble aspiration which if loyally accepted by all nations would bring the blessings of peace to a war-weary world. On the other hand, critics have observed that even without the implied reservations the Pact was little else than a pious wish. It contained no apparatus for enforcement. It offered no means of co-operation or even consultation between nations which wished to preserve the peace in the face of a threatened aggression.

It gave no promise of collaboration to remove the incentives to war, or to alleviate international friction by a policy of peaceful change. Furthermore, the only existing mechanism for universal co-operation in maintaining peace—the League of Nations—had been repudiated by the United States, while the only world court was not supported by this Government. Cynics said there had never been a war that was not a "war of self-defense" and that the implied reservations made the treaty worse than useless, inasmuch as it raised false hopes. In spite of these defects European powers welcomed the Pact as a means of attaching the United States to the more practical system of international consultation.

The Pact was invoked by Secretary of State Henry L. Stimson in 1931 after the invasion of Manchuria by Japan. The diplomatic contest between Japan on one side and the United States and the member states of the League of Nations on the other side continued several years. The United States opposed the Japanese aggression as a violation of the Paris

Peace Pact and the Nine Power Treaty of 1922 which guaranteed the Open Door in China. The League of Nations based its opposition on both treaties as well as on the Covenant. Unhappily, the United States and the League failed to co-ordinate their resistance and Japan was able to flout their protests. In 1932, Secretary Stimson, in a note to Japan declared that the United States would not recognize any situation or treaty accomplished by means contrary to the obligations of the Paris Peace Pact. This policy, known as the Stimson Doctrine or the Non-Recognition Doctrine, was adopted in 1933 by the Assembly of the League when it recommended the nonrecognition of the puppet state Manchukuo. In 1937 the United States joined nineteen powers at the Brussels Conference in condemning Japan. But while the United States and the League states shrank from applying sanctions, Japan continued its brutal aggression in China.

Equally unsuccessful was the attempt of the United States to invoke the Pact to stop the aggression of Italy on Ethiopia in 1935. The Pact was invoked with greater success in the disputes between Bolivia and Paraguay over the Gran Chaco and between Colombia and Peru over Leticia which broke out in 1932. Faulty collaboration between the United States and the League states delayed settlement, particularly of the Chaco dispute, which was resolved only after several years of bloodshed.

Isolationists in the United States deplored the Pact as tending to draw their country into closer collaboration with the League of Nations. Opposed was the argument that the United States ought to support the League even more strongly in the interests of world peace. This dispute became irrelevant, however, and the Pact itself largely a dead issue in the light of wholesale aggression by Germany before and during World War II. K.C.

See INTERNATIONAL RELATIONS.

REORGANIZED CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS. See LATTER DAY SAINTS.

REPARATIONS, GERMAN. See DAWES PLAN; WAR DEBTS (Young Plan).

REPEAL. When a legislative body votes to revoke or annul a statute previously passed, it is said to pass an act of *repeal*. The repealing act may state its purpose definitely, or its provisions may be worded in such a way that the revocation of the older act is implied. In the one case, the legislative body passes an *express repeal*; in the other, a *repeal by implication*. Only a portion of an act is sometimes repealed, and in such case, its other provisions remain in force. An existing law may also be altered or modified in some particulars (see AMENDMENT). A good example of the repeal of a statute in American history is provided by the legislation connected with the organi-

zation of the territories of Kansas and Nebraska. The Kansas-Nebraska Bill (See KANSAS, History) abrogated, in effect, the Missouri Compromise, and Stephen A. Douglas introduced a second bill specifically declaring the Missouri Compromise "void and inoperative."

REPLEVIN, *re plev' in*. A owned a pasture adjoining B's cornfield. Two of A's cows broke down the fence and destroyed a portion of B's corn. B found the cows in his field and drove them to his barn. He refused to return them to A until he received full compensation for the corn destroyed. A appealed to the court for a writ directing the sheriff to seize the cows and return them to him. A's action in law constituted a *replevin*; that is, an action to recover goods or chattels that have been unlawfully taken, or that are unlawfully detained. In a writ of replevin, the sheriff is directed to seize the property described, and to return it at once to the party from whom it was taken, who is known in the case as the *plaintiff*. In his application for replevin, the plaintiff must assure the court by his bond, or otherwise, that whatever damages the defendant may be found entitled to will be paid. When the action is decided in favor of the plaintiff, he is entitled to recover his property; in case it cannot be restored, he is entitled to an equivalent cash value, together with such damages for its wrongful seizure as the court may allow. In case the defendant is unable to pay, the plaintiff may bring suit against the defendant's bondsmen, if any there be.

REPOUSSE, *reh poo sa'*. See EMBOSSE.

REPOUSSE PROCESS. See SCULPTURE.

REPPLIER, *rep' leer*, AGNES (1858-), an American essayist, born in Philadelphia. After her graduation at Sacred Heart Convent, Torresdale, Pa., she began a literary career by contributing to numerous magazines. She has a delightful way of tingeing her discussions with light banter and harmless irony, with the result that her writings on even the most serious subjects are interesting and entertaining.

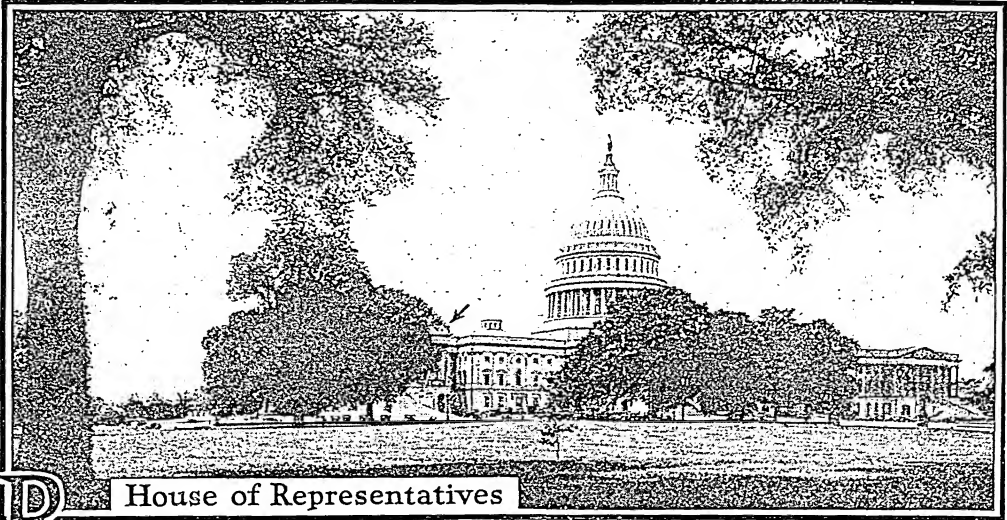
Representative Books. In 1888 appeared *Books and Men*, her first volume. Among others are *Points of View*, *Essays in Idleness*, *The Fireside Sphinx*, *In Our Convent Days*, *Americans and Others*, *The Cat*, *Counter Currents*, *To Think of Teal*, and *Eight Decades*.

REPRESENTATIVE DEMOCRACY. See REPUBLIC.



Photo: Brown Bros.

AGNES REPPLIER



R House of Representatives

REPRESENTATIVES, HOUSE OF, the lower chamber of the legislature in many governments, so called because its members *represent* the people. In the United States the House of Representatives is the lower chamber of Congress; the Senate, the upper. It was modeled somewhat on the British House of Commons. The constitutional provision that all bills for raising revenue shall originate in the House likewise has a British source.

Apportionment of Members. The Constitution provides that "the House of Representatives shall be composed of members chosen every second year by the people in the several States" (Article I, Section 3). As adopted in 1789, the Constitution did not define congressional suffrage other than to provide that the voters should be the same as those qualified to vote for the most numerous branch of the legislature in the respective states. The Fifteenth and Nineteenth Amendments later forbade any state to deny the right to vote on account of race, color, previous condition of servitude, or sex.

The Constitution gives Congress the power to determine the size of the House of Representatives and to apportion Representatives, subject to three limitations: (1) representation shall be apportioned among the several states according to their population; (2) the number of Representatives shall not exceed one for every 30,000 inhabitants; and (3) each state shall have at least one Representative. The Constitution clearly implies that reapportionment shall occur after every decennial census. And, with the exception of 1920, this has been done. At present, there is one representative to each 302,690 (approximately).

In 1789, the House had 65 members; today there are 435. This is a comparatively large body, and any increase would tend to make it

unwieldy. Yet at every reapportionment states which stand in danger of having their representation reduced, endeavor to increase the size of the House. The Reapportionment Act of 1929 provides that after each census the President shall transmit to Congress a statement (prepared by the Bureau of the Census) showing the number of Representatives to which each state is entitled. Since 1941 all Congressional apportionments have been determined by a method of equal proportions, based on percentage differences between the states.

Congressional Districts. The Constitution requires a direct popular vote in each state for Representatives. It provides that the time, place, and manner of holding the elections shall be prescribed in each state by the legislature thereof, subject to the right of Congress to make or alter such regulations. In early days, Congress left the states to their own devices, and the usage varied. In some states the Representatives were chosen from single-member districts; in others, on a general ticket covering the whole state. In 1842, Congress laid down the requirement that Representatives be elected by districts composed of contiguous and compact territory containing as nearly as practicable an equal number of inhabitants. A later law permits a state receiving an increase in its quota to keep its districts intact, if it so desires, and to elect the additional Representatives from the state at large. Several states now elect one or more Representatives-at-Large.

In drawing the boundary lines of the congressional districts, political parties in various state legislatures have been tempted to take a partisan advantage called *gerrymandering*, the name dating from 1812 when Governor Gerry of Massachusetts indulged in a notorious redistricting of Massachusetts. The plot aims

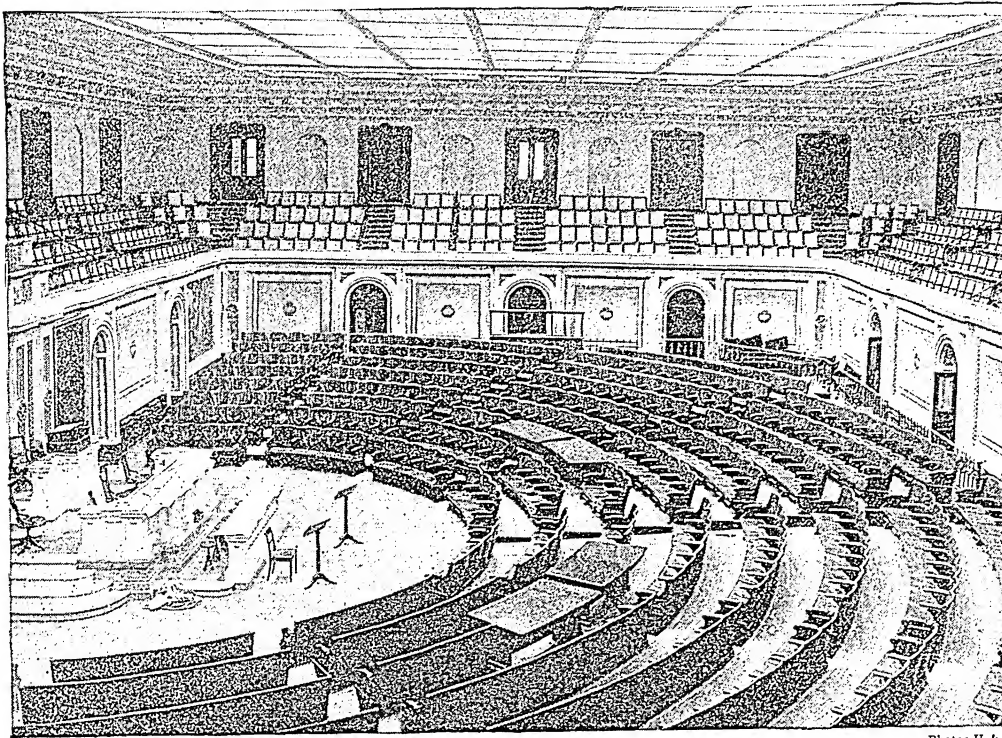


Photo: U & U

HALL OF THE UNITED STATES HOUSE OF REPRESENTATIVES

to construct the districts in such a way that the strength of the opposing party will be concentrated in a few districts, while the favored party retains a bare majority in all other districts. The result is that one party secures more than its proportion of Representatives in Congress.

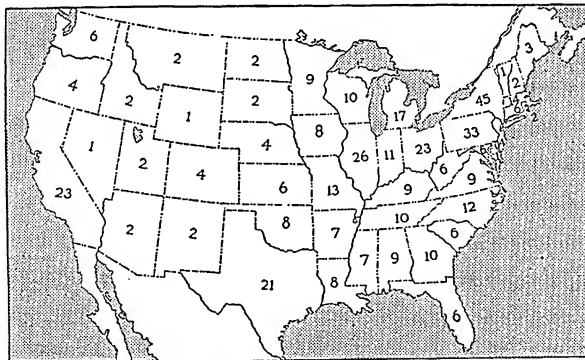
Congressional Elections. In 1872, Congress prescribed the secret ballot for congressional elections, and later provided that if changes were made in the date of the elections, states should adopt the Tuesday following the first Monday in November in every second year. All states have now conformed to this date except Maine, which uses the second Monday in September.

Unlike British practice, which refers contested parliamentary elections to the courts, the Constitution gives each chamber the power to

judge of the "elections, returns, and qualifications" of its members. Thus, every dispute regarding the election of a Representative is decided by the House itself. There are four

qualifications of a Representative specified by the Constitution. He must have attained the age of twenty-five years, have been a citizen for seven years, be a resident of the state, and he shall not hold any Federal office.

Organization and Officers of the House. The Constitution provides that each chamber may de-



THE NUMBER OF REPRESENTATIVES

The apportionment indicated above was based on the census of 1940. The number of representatives allowed the various states may vary with each census.

termine the rules of its proceedings. Every two years the newly elected House is organized. The clerk of the former House calls the roll and administers the oath of office, a Speaker is elected, and the rules of the former House are adopted. The rules are a most complicated code governing all parliamentary activity.

Like the English House of Commons, the House of Representatives chooses its Speaker. But, unlike the British presiding officer, the American Speaker is not an impartial officer. It is expected that so far as the rules permit he will promote the will of his party which has, of course, a majority in the House. The Speaker presides over the House; the only way a member can gain the ear of the House is by being "recognized" or given the floor by the Speaker.

The Committees. As in most English-speaking legislatures, much of the work of Congress is done in committees. The House has forty-seven standing committees, each consisting of from three to thirty-nine members. The chief committees are: (1) ways and means, the committee in charge of all revenue-raising measures; (2) appropriations, in charge of all bills for spending money; (3) judiciary; (4) banking and currency; (5) interstate and foreign commerce; (6) rivers and harbors; (7) agriculture; (8) labor; (9) military affairs; (10) naval affairs; (11) public lands; and (12) rules.

Each committee is composed of majority and minority members, the former being those who belong to the majority party in the House, while the minority members come from the other major party. While the committees are elected by the House, they are really chosen by the political parties in their respective caucuses.

Leadership of the House. Before each Congress convenes, the members of each major party hold caucuses or conferences to choose its candidate for Speaker and its *floor leader*. The floor leader is an extralegal official; while the Speaker presides, the floor leader of the majority party manages debate from the floor. He is assisted by a *steering committee* also chosen by the caucus. These leaders are often called the "invisible government" of the House. Without the responsibility possessed by the British cabinet, they assume the burden of drafting a program of legislation and pushing it through the House. Under the administration of Franklin D. Roosevelt, the President himself practically assumed direction of the coterie of House leaders.

K.C.

Related Subjects. The reader is referred to:

Assembly	Impeachment
Congress of the United States	Legislature
Constitution of the United States	Senate
	Speaker
	Tariff

REPRIEVE, *re preev'*, suspension to a certain future date of putting into effect a sentence passed on a criminal. In capital cases, it is commonly called a *stay of execution*. Reprieves are usually granted to allow inquiry into the legality of the conviction, or to give time for examination of alleged new evidence.

The power to grant a reprieve is vested in the chief executive of a state or nation. A reprieve is in no sense a pardon (which see).

REPRODUCTION, in biology, the process, either sexual or asexual, by which plants and animals produce offspring. In psychology, recall of previous experience. See BIOLOGY; BREEDING; EUGENICS; HEREDITY; MEMORY; PSYCHOLOGY.

REPTILES, *rep' tilz*, a class of cold-blooded, scaly vertebrates, which wriggle along on the belly, or crawl on small, short legs. The scientific name is *Reptilia* (see ZOOLOGY [Divisions of the Animal World]). The snake is not, as many suppose, the only reptile. The group is much more comprehensive, and is represented on the earth at the present time also by lizards, turtles, crocodiles, and alligators. In the remote early periods, when the earth swarmed with huge, ungainly monsters of all sorts, the reptiles included forms even stranger than those of today—such creatures as the ichthyosaurs, dinosaurs, and the pterodactyl (see DINOSAURIA; PTERODACTYL). The last of these is especially interesting, in that it shows the early kinship between reptiles and birds, for the pterodactyl had wings and flew.

The young of reptiles are usually hatched from eggs, but some forms produce their young alive. Reptiles have no gills like the fish, but breathe altogether through the lungs, though many of them spend much of their time in the water.

L.H.

Related Subjects. For a detailed and systematic study of this class of vertebrates, the reader is referred to the following articles:

Adder	Gecko
Alligator	Gila Monster
Anaconda	Glass Snake
Asp	Horned Toad
Bird	Iguana
Blacksnake	Lizard
Blindworm	Milk Snake
Boa	Moccasin Snake
Chameleon	Monitor
Cobra	Python
Copperhead	Rattlesnake
Crocodile	Snake (with list)
Dragon	Turtle
Garter Snake	Viper
Gavial	

REPUBLIC, *re pub' lik*, that form of government in which the supreme power rests in the whole body of its citizens, or, technically, in that part of the whole body which possesses the right to vote. Control of the affairs of such a government is exercised through citizens elected by the whole people, who delegate to such selected officials, for short periods, authority to maintain the necessary power. In theory, the authority of any official extends no further than the limits imposed by the citizen body, as expressed by their votes, and officials are expected to regulate their actions according to

the known will of the people whom they represent.

A republic is a near approach to a pure democracy. In the latter, all the people meet together in one place to frame their laws, and to instruct selected persons to execute them. If a country is so large that it is impossible to have a common meeting place for legislation in which all may participate, laws are enacted by a representative assembly, composed of delegates selected by the mass of the people; these make the laws, and other citizens selected by the people execute them. A republic, then, is a *representative* democracy, rather than a pure democracy.

The United States is the most conspicuous example of a successful republic in the world, and when founded, in 1776, was the only important nation having that form of government. The republic of China is the largest in area, and the least stable; the republic of San Marino is the smallest; its stability is guaranteed by Italy. France ceased to be a republic in 1940 after surrendering to Germany and setting up the Vichy government. Switzerland, since its independence was declared in the Napoleonic era, has become one of the most enlightened of the world's republics. Portugal deposed its king in October, 1910, and instituted a republican form of government, which was recognized by the nations early in 1911. With the defeat of the Germanic powers in 1918, several new republics were established in Europe, including Germany itself, Poland, and Czechoslovakia; the two latter have been dismembered. Greece was a republic from 1924 to 1935. Great Britain and the self-governing units of the British Commonwealth of Nations have forms of government closely akin to the republics.

The world's republics (several of them in name only, since many are virtual dictatorships) are as follows:

North America. United States, Mexico.

Central America. Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador.

South America. Argentine, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela.

Europe. Andorra, Finland, Portugal, San Marino, and Switzerland.

Russia's official title includes the term *Soviet Republic*, but Russia is not a republic in the ordinary sense of the term, nor are Germany and Spain. Ireland is not a republic.

Elsewhere. China, Cuba, Dominican Republic, Haiti, Liberia, Turkey.

Related Subjects. Much correlative material will be found in these volumes in the following articles:

Aristocracy	Monarchy	Soviet
Fascism	Oligarchy	Theocracy
Government		

REPUBLICAN ELEPHANT. See NAST, THOMAS, and illustration in the following article.

REPUBLICAN PARTY, one of the great political parties of the United States, organized in the years 1854 to 1856 as a protest against the extension of slavery. The name *Republican* was also used about 1792 by the followers of Jefferson, and by the adherents of Henry Clay and John Quincy Adams about 1825; but these names were current for only a few years, and in common usage, the name Republican is given only to the party which elected Lincoln to the Presidency in the autumn of 1860.

The Republican party owed its existence to the effort to extend slavery into the territories, and to the inability or unwillingness of the Whigs as a party to take vigorous steps in opposition. The Northern Whigs were already displeased by the passage and enforcement of the Fugitive Slave Law of 1850, but the Kansas-Nebraska Bill led to open revolt. On February 28, 1854, three months before the latter bill was passed, a local mass meeting of voters opposed to slavery met at Ripon, Wis., and adopted resolutions declaring that, if the Kansas-Nebraska Bill became a law, they would "throw old party organizations to the winds, and organize a new party on the sole issue of the non-extension of slavery." The local party was soon organized, and the name Republican was suggested almost at once as suitable for the new party. It was in Michigan, however, on July 6, that the opposition to the extension of slavery first led to a real party organization which formally adopted the name. In Maine, Massachusetts, Ohio, Illinois, Wisconsin, and other states, conventions were held during the summer of 1854, and almost at once the Republican party became a power in the North. In the fall of 1854, the Republicans elected eleven United States Senators and secured a plurality in the House of Representatives.

This sudden growth was due to the fact that nearly all opponents of the extension of slavery at once joined the party. Among the Republicans were most of the anti-slavery Whigs, including Lincoln, Seward, and Greeley; all the Free-Soilers, like John P. Hale and Charles Sumner; most of the Know-Nothings, including Nathaniel P. Banks and Schuyler Colfax; and a few Abolitionists who felt that the new party offered the best means of real opposition to slavery. Besides these complex elements, there were a few Northern anti-slavery Democrats, like Simon Cameron, Hannibal Hamlin, and William Cullen Bryant, who favored the Republican cause.

These elements were all represented in the first national convention of the party, held in Philadelphia in June, 1856. All the Northern states sent delegates, as did Virginia, Maryland, Delaware, and Kentucky. The platform's chief plank declared that it was both "the right and

the duty of Congress to prohibit in the territories those twin relics of barbarism, polygamy and slavery." John C. Fremont, the first Republican candidate for President, received 1,341,000 popular and 114 electoral votes to Buchanan's 1,800,000 popular and 174 electoral. Fremont carried the North, with the exception of five states; Buchanan carried the South. The Republican party had created an issue which, for the first time, established what became notable later as the "solid South." Four years thereafter, though still a minority party, it was stronger than any one of the Democratic divisions, and elected Lincoln as President. The platform of 1860 is noteworthy for its moderation; it denounced threats of disunion and declared that the rights of the individual states must be held sacred; but it also stated that "the normal condition of all the territory of the United States is that of freedom, which Congress is bound to preserve and defend." Four years later, the War of Secession had so crystallized the issues that the Republican platform openly declared slavery the cause of the war, and demanded its "utter and complete extirpation from the soil of the republic."

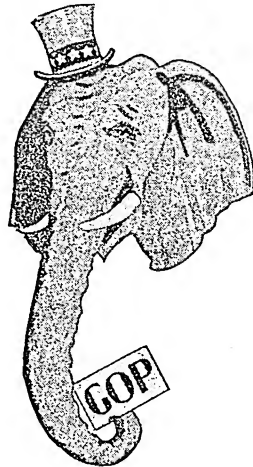
Inconspicuously placed in these platforms was a plank favoring a protective tariff, an issue which later gave the party a powerful hold upon the nation. When the war was ended and slavery abolished, the Republican party was left without positive aim, its great mission having been accomplished. In this extremity, the party leaders secured the nomination of Grant, who was not a politician, and who had been a Democrat before the war. It is, indeed, quite certain that if Grant had not been nominated by the Republicans he would have been chosen by the Democrats. Grant's personal popularity, added to the disfranchisement of the whites in the South and the enfranchisement of the negroes, made his election certain. The Republican party clung to the old war issues, which were the chief themes of its orators, and did not see the necessity of newer and more vital questions: In 1872 a few leaders, including Sumner, Greeley, Schurz, and

Charles Francis Adams, organized the Liberal Republican party, which sought to quiet the sectional bitterness and bring forward new issues. But the Republican party, secure in public confidence because of past achievements and its vigorous defense of the protective tariff, reflected Grant.

Grant's second administration was marked by the panic of 1873, the Credit Mobilier scandals, the exposure of the Whisky Ring, and other events which tended toward disquiet. The nomination and election of Hayes, followed by the end of reconstruction in the South, ended the discussion of war issues. The topics of the day then became civil service, bimetallism, resumption of specie payments and other financial issues, and, lastly, the tariff. From the beginning of its existence, the party had been committed to a high protective tariff, and on this issue it won many elections. In 1884 Cleveland was elected chiefly because Republican dissenters declined to vote for Blaine, and in 1896 free silver was the deciding issue, but in every other election until that of 1916, the tariff question was uppermost. The high water mark in tariff legislation was the McKinley Bill, which brought about the election of William McKinley as President in 1896; that year the issue which overshadowed the tariff, however, was the money question—free silver or the gold standard. Only twice—in 1892, when Cleveland was elected, and in 1912, when Wilson was chosen—did the Democratic policy of low tariff secure a victory. The election of President Wilson, however, was primarily due to a breach in the Republican ranks, resulting in the defection of Theodore Roosevelt and his adherents, and the organization of the Progressive party. In 1916 the tariff was not an issue; Woodrow Wilson was reflected on his record—he was President of a nation which was vitally interested in his efforts to keep the country out of war.

In 1920 the Republicans won by the greatest majority ever recorded up to that time; Harding was elected because Wilson insisted that the United States should join the League of Nations, and because the people were desirous of seeing a "return to normalcy." Upon the death of Harding, Coolidge became President; he was elected in 1924 by even a greater popular majority. In 1928 the party was again victorious and elected Herbert Hoover, whose plurality, however, was some less than that of Coolidge. However, because of the breaking up of the "solid South," Hoover received a larger electoral plurality, securing 444 votes. Results of the next three elections were as follows: Roosevelt 472, Hoover 59, in 1932; Roosevelt 523, Landon 8, in 1936; Roosevelt 449, Wilkie 82, in 1940.

Related Subjects. The reader is referred to:
 Abolitionists Free-Soil Party
 Democratic Party Fugitive Slave Law



THE "REPUBLICAN ELEPHANT"

A cartoon originated by the caricaturist Thomas Nast.

Kansas-Nebraska Bill
Know-Nothings
League of Nations

Political Parties
Progressive Party
Whig

REPUBLICAN RIVER. See maps, Kansas and Nebraska.

REQUIEM. See MASS.

REQUISITION. See EXTRADITION, subhead.

RESACA DE LA PALMA, *re sah' kah day lah pahl' mah*, BATTLE OF. See MEXICAN WAR.

RESERVATIONS FOR BIRDS. See BIRD (Refuges and Sanctuaries).

RESERVE OFFICERS' TRAINING CORPS, popularly referred to as the R. O. T. C., were authorized in the National Defense Act of 1916, which provided for military instruction in colleges and universities. The act is not mandatory, and the establishing of military instruction rests within the jurisdiction of the school or the state legislature. The courses occupy from ninety-six hours in the first year to 160 in the fourth, and include field training of six weeks during the summer.

The earliest Students' Military Instruction Camps were organized by the army in 1913. At the outbreak of the World War, citizens began to see the urgent need of preparedness, and in 1915 voluntarily established "Business Men's" summer training camps at Plattsburg, N. Y., Fort Sheridan, Ill., and San Francisco, Calif. Plattsburg, under the command of General Leonard Wood, was the first and most successful of these. Summer training courses have been continued since the war (see TRAINING CAMPS, MILITARY).

Little had been accomplished in the building of the R. O. T. C. when the United States entered the war. In May, 1917, sixteen R. O. T. C. camps were started without waiting for the authorization of Congress. They operated throughout the war, training officers capable of handling troops at the front. Since the war, the R. O. T. C. has gone back to its original purpose of military training in the colleges and universities.

R. O. T. C. has two divisions: *Senior* units enroll students in colleges and universities, where training may be offered in all arms and services of the army; *Junior* units are found in high schools and in other secondary schools. This course consists of three years' training, of three hours of work per week. Only infantry training is offered.

Those who complete successfully the four years' training course in college are eligible for a commission in the Reserve Officers' Corps, providing they attended a summer camp for six weeks in their third year of college. During the last two years of college R. O. T. C. members receive about \$100 a year; while at summer camp, they receive food, equipment, clothing, doctors' care, and the pay of a private.

RESERVOIR, in its broadest sense, a large receptacle for storing liquids or gases. In the

sense in which the term is ordinarily used, a reservoir is a large receptacle for storing water to be used in irrigation, for city purposes, or for stored-up power which, when released, will operate machinery. A lake is a natural reservoir, and some cities obtain their water supply from lakes. The Great Lakes constitute the source from which the people of cities along their shores obtain water supplies for all purposes. A *cistern* is a small reservoir for storing rain water for family use.

An artificial reservoir for public use is made by constructing a dam across a narrow valley, or by excavating a basin in a comparatively level tract of land. The Croton Reservoir in New York, which supplies water to the metropolis of that state, is one of the most notable reservoirs in the United States.

The greatest engineering skill is often required in the construction of reservoirs. The site must be selected with care, if the water is to be used for household purposes. The sources from which the reservoir is to be filled should be free from animal and vegetable impurities and the ground which is to form the basin should be cleared of all vegetation and soil containing organic matter. A concrete bottom is an additional protection against contamination of the water.

Some small cities have their water stored in large tanks supported upon high, steel framework, so that the pressure will be sufficient to force water to the tops of the highest buildings. These tanks, called *standpipes*, are not uncommon in level sections, but they have not always met expectations; the water pressure has often been too low.

The largest reservoirs are those formed by dams for storing water for irrigation (which see). In the United States, the construction of the works connected with large irrigation projects is under the direct control of the United States Bureau of Reclamation, Department of the Interior.

Related Subjects. The reader is referred to:

Aqueduct Dam Waterworks

RESIDENT, a British colonial official. See RAJAH.

RESIDENT COMMISSIONER. See TERRITORY.

RESIDUAL, *re zid' u al*, AIR. See BREATH AND BREATHING (Lung Capacity).

RESINS, *rez' ins*, a class of vegetable substances used extensively in the preparation of varnishes, and to some extent in medicine. A familiar method of classification divides them into three classes: (1) those which exude from plants spontaneously or from cuts made in stems and branches; (2) those extracted from the wood by the use of hot alcohol or other solvent; and (3) fossil resins, such as gum copal and amber. A typical resin is transparent or

translucent, yellowish or brownish in color, insoluble in water, but soluble in alcohol, ether, and volatile oils. It melts and burns easily, and can be charged with negative electricity by friction. Resins are found in those substances known as gum resins, such as asafetida, aloes, and myrrh, and in balsams, a group of liquid or half-solid substances including benzoin and storax. When combined with essential oils, they are known as *oleoresins*. The common resin of commerce, which exudes from several species of pine, and is a product of turpentine, is called *rosin*. Lac is one of the few resins of animal origin.

Chemically, pure resins are all compounds of carbon, hydrogen, and oxygen. Methods of producing synthetic resins have been perfected, and we now have many objects, such as electric-light sockets and radio parts, made of artificial resins. G.M.S.

Related Subjects. The reader is referred to:

Amber	Gum Resins	Rosin
Balsam	Lac	Turpentine

RESPIRATION, *res pih ra' shun*. See BREATH AND BREATHING; DIAPHRAGM.

RESPIRATOR. See IRON LUNG.

RESPONSIBLE GOVERNMENT. See CANADA (History); also, GREAT BRITAIN (Central Government).

RESTIGOUCHE RIVER, *res ti goosh'*, a small Canadian river, forming a part of the boundary between the provinces of Quebec and New Brunswick. It is probably the most famous trout and salmon stream in the world. Like the Miramichi and other rivers in this part of the Dominion, it flows through territory much of which is still wild, and offers great inducements to the sportsman as well as the lumberman. The Indian word *Restigouche* means "the river which divides like a hand," and was given to the stream in allusion to its five branches, the Matapedia (meaning Musical), the Upsalquitch (Blanket), the Kedgwick (Large), the Patepedia (Little), and the Wagan (Knife).

RESTORATION, *res toh ra' shun*, in English history, the return to monarchy in 1660, after the rule of Oliver Cromwell. It was signalized by the recall of the House of Stuart, in the person of Charles II. The tyrannical Charles I was beheaded in 1649, and England became a Commonwealth under Cromwell. The latter was a strong, capable administrator, and as long as he lived, the republican government which he established was respected and successful. But his son, Richard, who succeeded him as Lord Protector, had not inherited the father's strong will or political ability, and the army finally forced him to abdicate (1659).

The army then undertook to control Parliament, compelled it to dissolve, and aroused great opposition by its high-handed methods. Unsettled conditions led General George Monk,

supported by the Scottish army—always loyal to the Stuarts—and a part of the English forces, to reassemble the Long Parliament, order it to dissolve, and call a general election. The new Parliament voted to invite Prince Charles, the exiled son of Charles I, to take his seat upon the throne. When he journeyed to London for the coronation, he was greeted everywhere with wild enthusiasm. His reign was dated back to the execution of Charles I, instead of the actual year of the restoration, and those who had played leading parts in his father's trial were put to death. So strong was the reaction to royalty that the great Cromwell's body was dragged from its grave and hanged.

Related Subjects. The reader is referred to:

Charles (England)	Furniture (The Restoration)
Commonwealth of England	Long Parliament
Cromwell, Oliver	Monk, George
England (History)	Scotland (History)

RESTRICTIVE ENDORSEMENT. See NEGOTIABLE PAPER.

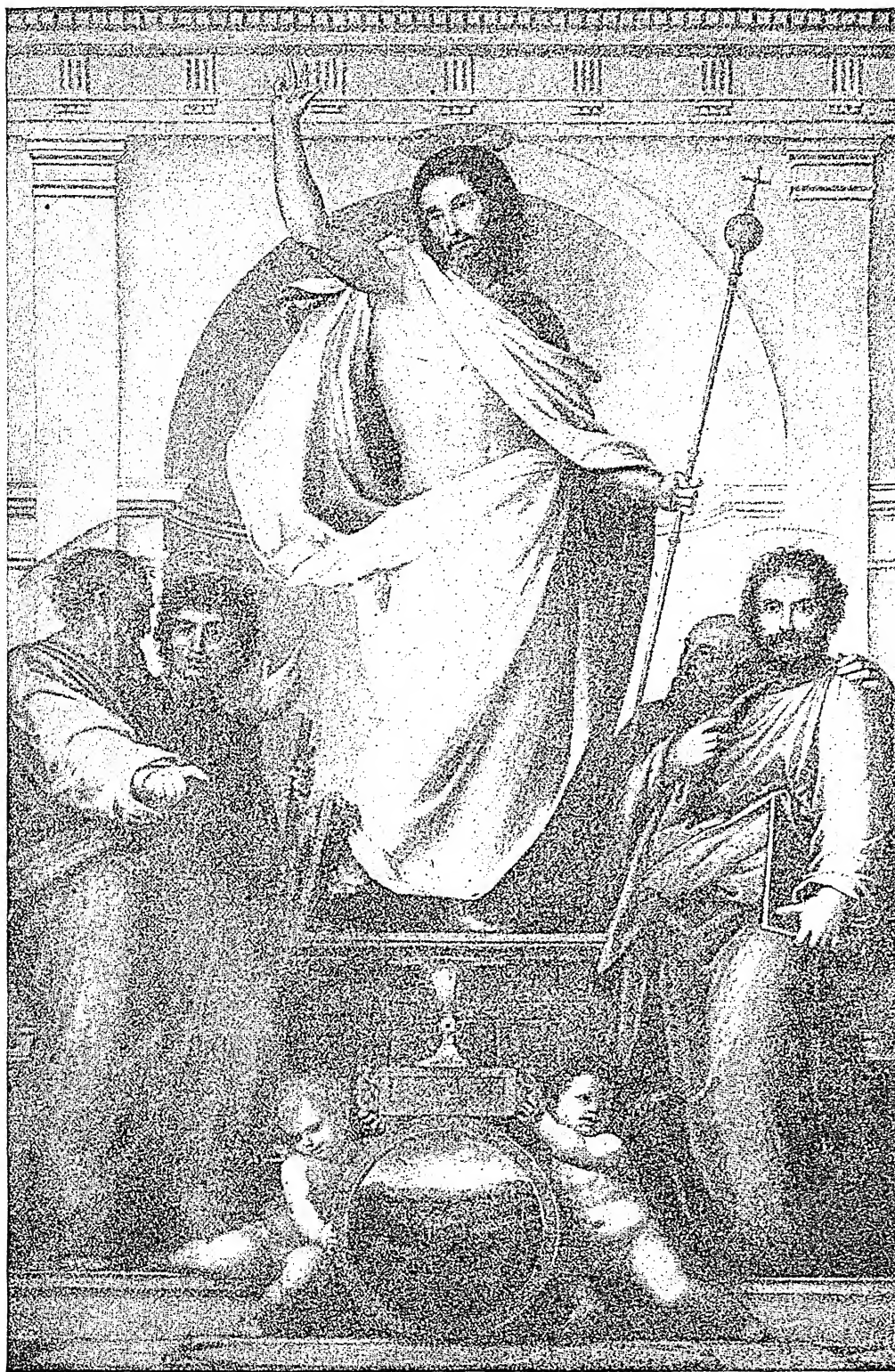
RESUMPTION OF SPECIE PAYMENTS. See SPECIE PAYMENTS, RESUMPTION OF; HAYES, R. B. (Administration).

RESURRECTION, *rez u rek' shun*, the restoration of the dead to life. Belief in the resurrection of the dead was held by the Egyptians and other ancient peoples; it was somewhat further developed by the sect of the Pharisees, but was clearly formulated only in the New Testament, on the basis of the resurrection of Jesus. The best proof offered that Jesus did rise from the dead is the effect the event has had on His followers. Only faith in a living leader can explain the zeal of the early Christians, their simple, unflinching heroism, and the conquering power of their message; and the same faith must account for the triumphs of Christianity to the present day.

The manner of the resurrection, however, has been a subject of much conjecture, and men have never answered to their entire satisfaction the question discussed by Paul (*I Corinthians* xv, 35), "How are the dead raised up? and with what body do they come?" Some interpret the appearance of Jesus described in the Gospels as occurring after the resurrection, as being that of a glorified body, the result of the most stupendous of miracles. Others believe that, while the appearances were real, they were not physical manifestations, but inner revelations, or visions, such as Paul experienced on the road to Damascus (*Acts* xxii, 6-11). The former view is the one that has been most widely accepted by the Christian Church. See next page for a reproduction of a great painting on this subject.

Related Subjects. The reader is referred in these volumes to the following articles:

Gospels	Paul
Jesus Christ	Pharisees



From the painting by Fra Bartolommeo

THE RESURRECTION

RESURRECTION BAY, an arm of the Pacific Ocean, indenting the shore of Alaska (which see).

RESURRECTION PLANT, another name for the Jericho rose (which see).

RESZKE, *resh' ke*, DE, the family name of two Polish brothers who became famous as singers in opera.

Jean de Reszke (1850-1925) early attracted notice as a boy soprano in the cathedral at Warsaw, Poland. He made his first appearance in opera in 1874, as a baritone, singing the part of Alfonso in *La Favorita*, at Venice. For two seasons he carried baritone rôles, but, as it was apparent that he was singing parts too low for his voice, he retired from the stage at the end of his second season, and for two years studied tenor rôles. His appearance as the tenor in *Robert le Diable*, at Madrid in 1879, was the beginning of a great triumphal career, in which he became known throughout Europe and America as one of the most artistic singers and actors of the operatic stage.

His success was due to an admirable combination of voice, acting ability, and attractive personal appearance. Among his notable rôles were Radamès in *Aïda*, Raoul in *The Huguenots*, and the tenor parts in *Faust*, *Lohengrin*, and *Romeo and Juliet*. He was for years a favorite star with the patrons of the Metropolitan Opera Company of New York. In 1904 he retired from the stage to establish a singing school in Paris.

Edouard de Reszke (1855-1917) won fame as one of the greatest dramatic bass singers of his time. He received his early musical training from his brother Jean, and made his first stage appearance in 1876 at the Theater of the Italians, in Paris, as the king in *Aïda*. He was frequently engaged to sing in the same company with his brother, and continued to appear at Covent Garden, London, and at the Metropolitan Opera House, New York, for several seasons after his brother retired. In 1907 he became a teacher of music in London. Among his successful parts were the king in *Lohengrin*, Marcel in *The Huguenots*, Mephistopheles in *Faust*, Hagen in Wagner's *Götterdämmerung*, and Hunding in his *Die Walküre*. He died in Poland, at his estate in Eriet-rikov.

RETAINER, a formal agreement between an attorney and a client to prosecute or defend a suit at law, or the engagement of an attorney by a client to act for him whenever the attorney's services are needed. A retainer of the first sort is *special*; of the second, *general*. The retainer is accompanied by a *retaining fee*, which is also called a retainer. The acceptance of the retaining fee prevents the attorney from accepting a retainer from the other party to the case, or, in case of a general retainer, from performing services that would be against the interest of his client.

RETCHING. See VOMITING.

RETICULO-ENDOTHELIAL, *re tik' u lo en do the' lih al*, **CELLS**. See BILE.

RETICULUM, *re tik' u lum*. See RUMINANTS.

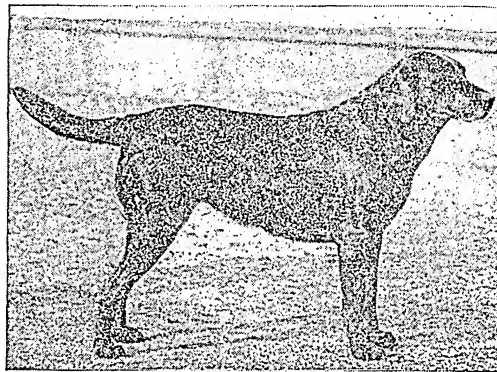
RETINA, *ret' ih' nah*. See EYE.

RETINITIS, *ret ih ni' tis*. See BLINDNESS (Common Eye Diseases).

RETORT. See DISTILLATION; GASOLINE.

RETREAT, an army bugle call. See BUGLE.

RETRIEVER, *re treev' ur*, a field dog trained to find and bring back game, especially waterfowl. There are two principal kinds, the Eng-



LABRADOR RETRIEVER

lish and the American, the latter known as the *Chesapeake Bay dog*. This American retriever, whose name comes from the district where he first won fame, is the finest dog of his kind. The coarse, thick hair, the color of sedge grass, covers a large, heavy frame that is built for strength and endurance. The dog weighs sixty-five pounds. His legs are rather short, but very strong, and he has webbed feet. He is an expert swimmer and has an unerring scent, and is well fitted to cope with the largest and strongest birds and the roughest seas. There are two distinct varieties of the English retriever, one with a black or yellow coat and sleek head, known as the *Labrador*, and the other with a flat or wavy coat, either black or reddish-brown. English retrievers have been bred by crossing the spaniel and the Newfoundland dog, or the spaniel and the poodle, all of which are very keen of scent. See DOG. W.J.

RETTING. See JUTE; FLAX; HEMP.

REUBEN. See JOSEPH.

REUTER, *roi' tur*, **AGENCY**. See ASSOCIATED PRESS.

REVAL, *ra' vahl*, officially known as TALLINN, the capital of Estonia (which see).

REVEILLE, *rev e le'*, or *reh vel ya'*, an army bugle call. See BUGLE.

REVELATION, *rev e la' shun*, **BOOK OF**, the name frequently given to the last book of the New Testament, in the English version called *The Revelation of Saint John the Divine*, and known also as the *Apocalypse* (which see). The oldest manuscript gives the title as *Apocalypse*, or *Apocalypsis Ioannon*. It is supposed to have been written by the Apostle John when he was living on the Isle of Patmos,

to which he had been banished. The first part contains a message to the Churches; the second includes a series of visions which are of such nature that there is a wide difference of opinion about their meaning. Some modern scholars believe that the book was written for the purpose of bringing together all the symbols of the Old Testament and showing them in their true relation. Many of the early Church Fathers, including Jerome, questioned its right to a place in the canon. Later, even Luther questioned it.

REVENUE, INLAND. See **INLAND REVENUE**; **INTERNAL REVENUE**.

REVENUE-CUTTER SERVICE. See **COAST GUARD**.

REVERE, MASS. See **MASSACHUSETTS** (back of map).

REVERE, *re veer'*, **PAUL** (1735-1818), an American patriot and a hero to every American because of the part he played in the events which ushered in the Revolutionary War. He was born in Boston, the son of a goldsmith, was educated as an engraver of copperplate, and had the honor of engraving and printing the first paper currency of Massachusetts. He was one of the leaders in the "Boston Tea Party" (which see), and became a member of the Boston League, which pledged itself to watch every British move.



Photo: Halliday

PAUL REVERE

From a painting executed during the later years of his life.

In April, 1775, the British commander, General Gage, sent out a force of 800 troops with orders to destroy the American military stores at Concord, about twenty miles from Boston. They were also to stop at Lexington for the purpose of arresting the "archrebels" Samuel Adams and John Hancock. To circumvent the British general, Revere made a famous ride, which inspired one of the most stirring poems in American literature, *Paul Revere's Ride*, by Longfellow. The plan of Gage was suspected by General Joseph Warren, and it was decided that Revere should mount his swift horse, ride ahead of the enemy to Lexington, and warn the people along the way. Accordingly, on the eighteenth of April, Revere—

Said to his friend, "If the British march
By land or sea from the town to-night,
Hang a lantern aloft in the belfry arch
Of the North Church tower as a signal light—
One if by land and two if by sea;
And I on the opposite shore shall be,

Ready to ride and spread the alarm
Through every Middlesex village and farm,
For the country-folk to be up and to arm."

Upon the appearance of Warren's signal, there was instant mounting and hard riding until dawn. (See next page.)

You know the rest. In the books you have read
How the British Regulars fired and fled;
How the farmers gave them ball for ball,
From behind each fence and farmyard wall,
Chasing the Redcoats down the lane,
Then crossing the fields to emerge again
Under the trees at the turn of the road,
And only pausing to fire and load.

The countryside was roused, and thus Gage's purpose was defeated. On his way to warn Concord, Revere was captured by the British, but was soon released. During the war, he became a lieutenant colonel of artillery. He died in Boston in 1818. In that city his home still stands (see page 873).

REVERSING FALLS. See **SAINT JOHN RIVER** (New Brunswick).

REVERSION. See **ATAVISM**.

REVILLAGIGEDO, *ray veel yah he ha' tho*, an island off the coast of Alaska (which see).

REVOLUTION, *rev o lu' shun*, a political movement, either military or civil, which has for its object the overthrow of government.

A revolution may be external or internal. An external revolution occurs when a part of a nation separates itself from the remainder and declares itself independent; the American Revolutionary War was of this kind. An internal revolution occurs when a nation as a whole repudiates its existing political organization and changes its form of government; the republic of France rising from the ruins of the empire is an instance; others are the abolition of the existing governments in Russia (1917), Germany (1918), and Greece (1924). A political revolution in Italy after the World War did away with the system of representative parliamentary government. When an internal revolution simply destroys an existing organization without definite plans for a substitute, the action is called *anarchical*; if the aim is to establish a new form of government, it is called *constitutional*; if the avowed intention is to change some governmental measure, or to change the personnel of the government, it is a *governmental revolution*. If a revolution succeeds in establishing a new and better government, those who participated are recorded in history as patriots; if it fails, the leaders are punished as traitors. Posterity, however, can usually judge to which of these classes revolutionists rightly belong.

Related Subjects. See the accounts of various revolutions in the articles **CHINA** (History of China); **ENGLAND** (History of England); **FRENCH REVOLUTION**; **GERMANY** (History of Germany); **MEXICO** (Government and History); **REVOLUTIONARY WAR IN AMERICA**; and **RUSSIA** (History of Russia, or the U.S.S.R.).



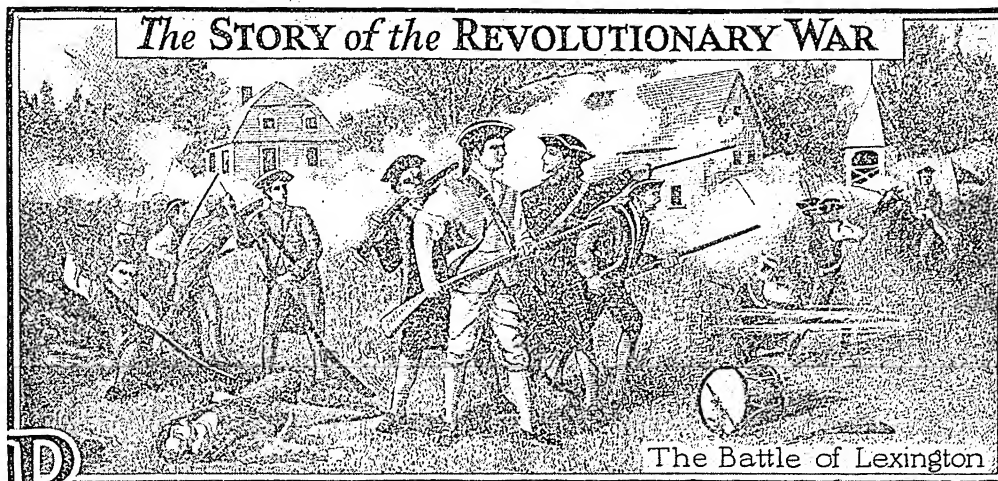
Photo: U & U

The Beginning of a Famous Ride. Statue of Paul Revere ready to mount his horse as soon as the light from the belfry should reveal the movement of the British. "One if by land, and two if by sea; And I on the opposite shore will be." Few secondary incidents in history have been presented in verse with such dramatic force as the metrical story by Longfellow.

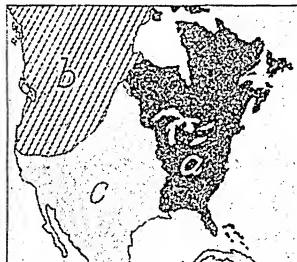
So through the night rode Paul Revere;
And so through the night went his cry of alarm
To every Middlesex village and farm,—
A cry of defiance and not of fear,
A voice in the darkness, a knock at the door,
And a word that shall echo forevermore!

For, borne on the night-wind of the Past,
Through all our history, to the last,
In the hour of darkness and peril and need,
The people will waken and listen to hear
The hurrying hoof-beat of that steed,
And the midnight message of Paul Revere.

—LONGFELLOW: *Paul Revere's Ride*



REVOLUTIONARY WAR IN AMERICA. At the conclusion of peace in 1763, following the French and Indian Wars, Great Britain was possessed of the greater part of the North American continent. It owned all the territory from the Arctic Ocean to Florida and west to the Mississippi River, while in Canada its wilderness empire stretched to the Pacific Ocean, although a part of the area was claimed by Spain. Except along the Atlantic coast, it was almost entirely a red man's land, but a fringe of prosperous colonies lined the seaboard, and settlements of hardy pioneers dotted the area west to the great river.



AFTER THE YEAR 1763

(a) English possessions; (b) claimed by Spain and England; (c) Spanish possessions.

The English government had no settled policy to apply to its loyal, growing, and ambitious colonies. In later times, and in other severe crises, it has, to use a phrase of its statesmen, "muddled through"; but in dealing with its American colonies, it met its one great defeat. Out of that defeat there developed a viewpoint so sane and an administrative policy so wise that Britain's possessions now encircle the globe, and millions of contented people thousands of miles distant from the mother country proclaim unswerving loyalty to the British flag. The responsible rulers of the empire accepted the lesson of their grave errors, and were careful never to repeat the mistakes that had proved so costly.

The loss of the colonies in America through the Revolutionary War left a feeling of bitterness which survived for generations, but with the spread of democracy in the world, there came a better understanding. In 1917 Foreign Minister Balfour of the British Cabinet laid a wreath on the tomb of George Washington at Mount Vernon and proclaimed him a patriot, thus expressing Britain's friendship.

Causes of the War

In 1763 King George III issued a proclamation decreeing that the land between the Allegheny Mountains and the Mississippi River should be reserved for the Indians. He desired to limit colonization to the coast area, to make control by Great Britain an easy matter. The French and Indian Wars had cost England about \$350,000,000; the king insisted that the American colonies, through taxation, should be forced to pay a part of that sum, notwithstanding the fact that they had plunged into debt to the extent of \$130,000,000 in behalf of the mother country. Edmund Burke (which see) said in Parliament that this demand was the origin of the quarrel between the home government and the colonies.

Moreover, the English government proposed to maintain a standing army of 10,000 men in America, the king declaring it necessary for the purpose of holding the conquered French-Canadians in subjection and to protect the colonists from the Indians. The colonists were to be asked to meet this expense by stamp taxes, but they protested against the burden, on the ground that they were strong enough to protect themselves from the Indians, and that they had no direct interest in Canadian affairs.

The British Prime Minister, Lord Grenville, held the very unpopular view that English colonies were merely places of trade, and that they existed only for the benefit of Great Britain. Many great Englishmen denounced such

a "shopkeeper's policy," but the king and his advisers determined to maintain the principle. The colonies loyally admitted the home government's right to levy export and import taxes, but they insisted that local industry was

ance policies, newspapers, and advertising sheets. A year was to elapse before the act was to be effective. Parliament debated the question heatedly. Burke spoke in favor of the colonies; William Pitt also denounced the measure.

When news of the passage of the act reached America, denunciation was bitter. The temper of the people was recorded in a Stamp Act Congress which met in 1765 in New York, with delegations from nine colonies. It affirmed that—

... the people of these colonies are not, and from their local circumstances cannot be, represented in the House of Commons in Great Britain, . . . and that no taxes ever have been, or ever can be, constitutionally imposed on them except by their respective legislatures.

Merchants threatened not to buy English goods as long as the act was in force. So-called "Sons of Liberty" plundered official stores, burned the obnoxious stamps, and forced officers to agree to abide by the will of the people. The resistance of America frightened the king and his Ministers, and the Stamp Act was repealed in 1766.

The Townshend Act. In the following year, the Townshend Revenue Act was aimed at the colonies. It provided that the colonists should pay the salaries of the governors, vice-governors, and judges sent by the king; in the choice of these the people affected had no voice, and they could not control their numbers. The act also legalized the writs of assistance, which had been previously declared unlawful. The colonies again threatened to boycott England's merchants, and the protest sent to England was effective in securing the repeal of the Townshend Act, excepting the provision relating to a tax upon tea.

Quartering Act and Boston Massacre. In 1766 England imposed upon the people of the colonies the duty of providing for the king's soldiers, each locality to care for the troops there quartered. In 1768 Boston was forced to receive several regiments, in spite of its protests. Two years later (1770), a mob of citizens, some of them of the irresponsible sort, not able longer to endure the affront to loyal English subjects, attacked the soldiers with clubs and other missiles and dared them to fire. What is known as the Boston Massacre resulted. The troops fired, killing and wounding several persons. Crispus Attucks, a negro, was the first man to fall in the Boston Massacre.

Committees of Correspondence. Alarmed at the constantly increasing tension between colonials and the English authorities, and fearing further trouble, Boston organized a Committee of Correspondence "to state the rights of the colonists . . . to the several towns and to the world." The movement was so popular



AT THE BEGINNING OF THE WAR

not to be taxed at will. Moreover, the colonies demanded representation in Parliament, that their voice might be heard, if a taxing policy were insisted upon. The rallying cry, "Taxation without representation is tyranny," was taken up with enthusiasm in every colony.

The Stamp Act. Possibly the manifold evidences of loyalty emboldened the king to adopt measures which otherwise he would have hesitated to enforce. As late as 1768, Samuel Adams of Massachusetts expressed the general feeling that "nothing but unkind usage could sever the ties which bound America to England." However this may have been, the king ordered his American officials to search in the colonies for smuggled goods, under questionable authority of his writs of assistance. In 1765 the Stamp Act was passed. This was extremely objectionable, for it threatened a very serious burden. Its plan of operation was similar to that of present-day internal-revenue laws; the colonists might evade some of Britain's taxing schemes, but there could be no escape from a system which made it necessary to affix stamps, valued from a halfpenny to fifty dollars (£10), upon all legal papers, insur-

that soon every village in Massachusetts possessed a similar committee, and by the spring of 1773, there were intercolonial committees which enabled all the colonies to work in harmony.

The Boston Tea Party and Its Results. When the Townshend Act was repealed by Parliament, a tax on tea was retained, to emphasize the royal right to impose taxation. The manner in which Boston disposed of the troublesome question is related in the article **BOSTON TEA PARTY**. In 1774 the ruling power in England further inflamed the passions of colonists by the passage of five obnoxious laws in retaliation for the lawless "tea party," which were termed the "five Intolerable Acts."

There seemed no longer a possibility of existence without organized effort to abate the evils which had been multiplying. A congress of the colonies, known as the First Continental Congress, met in Philadelphia in 1774 and adopted a "Declaration of Colonial Rights." It declared that the colonies alone had the right to enact local laws and to levy taxes; that the people were entitled to protection of the common law of England, and to trial by jury instead of deportation to England for trial; that the severe laws passed by Parliament were threatening their loyalty to the Crown. The Declaration asked that the king, "as the loving father . . . of his whole people," lessen their wrongs. When the document reached Parliament, Burke's voice was again heard in a speech which came to be known as the remarkable "On Conciliation with America." North was now Prime Minister; he, too, pleaded the cause of the colonies, but without avail. Further measures cut off the colonies from foreign trade and threatened the livelihood of New Englanders by cutting off their fishing privileges in Newfoundland waters.

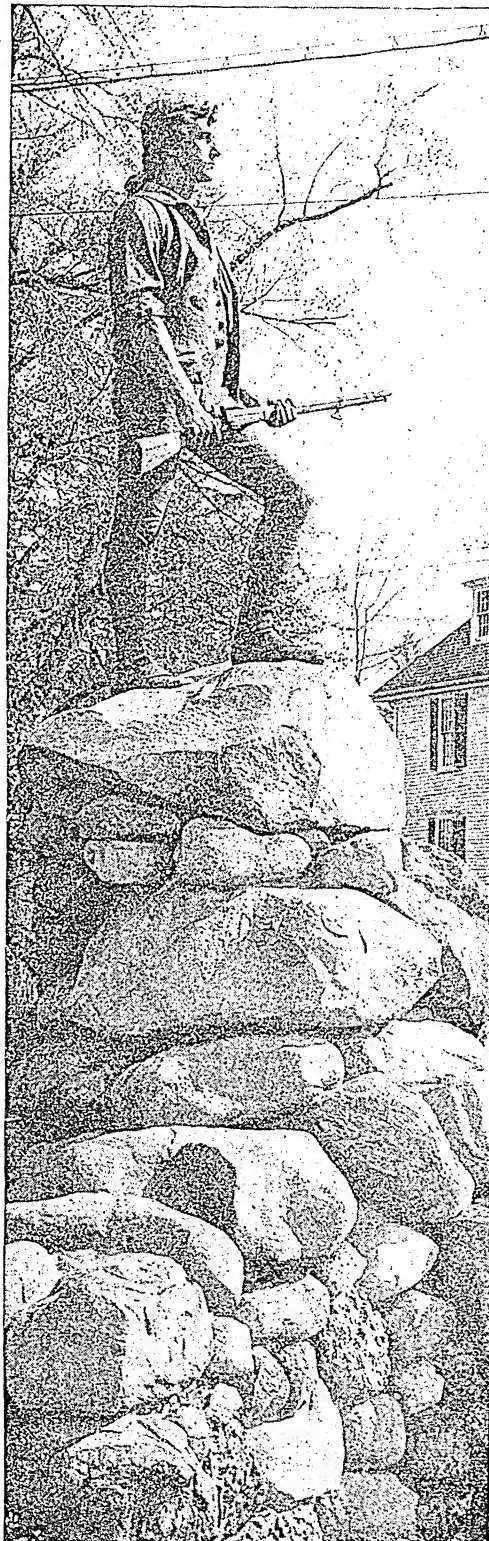
Lexington and Concord. The colonists began to prepare for armed resistance. They were stirred by Patrick Henry's—

Is life so dear or peace so sweet as to be purchased at the price of chains and slavery?

and throughout the narrow ribbon of colonies there were hurried preparations. General Gage, English commander in Boston, attempted to seize some cannon in Salem, but failed. He heard of military stores which had been secreted at Concord, twenty miles away, and sent 800 men to take them. Paul Revere,

THE MINUTEMAN

This is a picture of the statue of Captain John Parker on the Common, in Lexington, Mass. There the Revolutionary War began. Captain Parker was in command of the Minutemen when they were fired on by the British troops. The British then went on to Concord, where they were repulsed by the Americans at the famous bridge. On their retreat to Boston, the British soldiers were put to rout by the "embattled farmers."



by arrangement, rode all night of April 18, 1775, spreading the alarm; in the words of Longfellow—

A hurry of hoofs in a village street,
A shape in the moonlight, a bulk in the dark,
And beneath, from the pebbles, in passing, a spark
Struck out by a steed flying fearless and fleet;
That was all! And yet, through the gloom and the
light
The fate of a nation was riding that night;
And the spark struck out by that steed in his
flight
Kindled a land into flame with its heat.

On the morning of April 19, the British regulars faced seventy men under Captain John Parker at Lexington. "Don't fire unless you are fired on," Parker said, "but if they want a war, let it begin here." In the ensuing volley, seven Americans were killed. Pitcairn withdrew, and, hurrying on to Concord, destroyed all the stores he could find. On his return to Boston, the enraged farmers gathered in such force as was possible, and harassed his troops along the entire route.

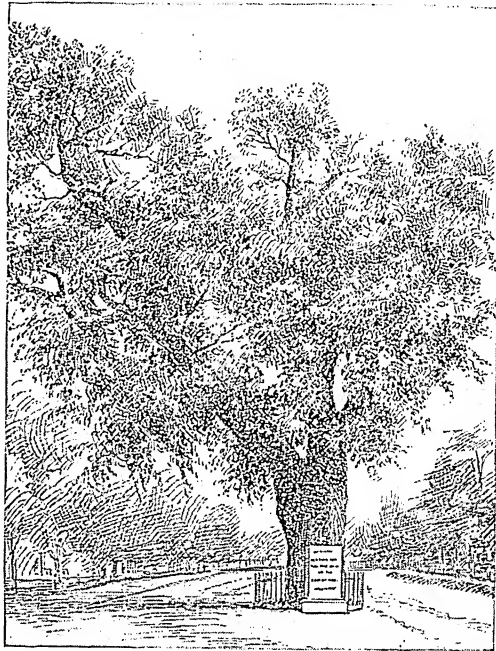
Proclamations. General Gage in Boston received additional British troops under Burgoyne, Clinton, and Howe, to cope with the insurrection. In June, 1775, he issued a public letter threatening death by hanging to all rebels who continued to resist the king's officers. He offered pardon to all who would "at once lay down their arms, excepting only Samuel Adams and John Hancock."

On the fifteenth of the same month, Congress appointed George Washington commander in chief "of all the Continental forces raised, or to be raised, for the defense of American liberty."

Events to July 4, 1776. Both sides prepared hurriedly for such events as might be forced upon them. While Congress was equipping the American forces, Gage decided to strengthen his position by seizing Bunker Hill, a height near Boston. The Americans were ahead of him, and he was forced to give them battle. Lexington, Concord, and Bunker Hill convinced

the Americans that war was inevitable, that allegiance to the king was no longer possible, and that independence must be achieved or attempted, by force of arms.

On July 4, 1776, Congress issued to the world the reasons why "these united Colonies are,



THE WASHINGTON ELM

This tree stood in Cambridge, Mass., until 1923, when it fell. On the tablet shown in the illustration were the words:

"Under this tree Washington
took the command of the
American Army, July 3, 1775."

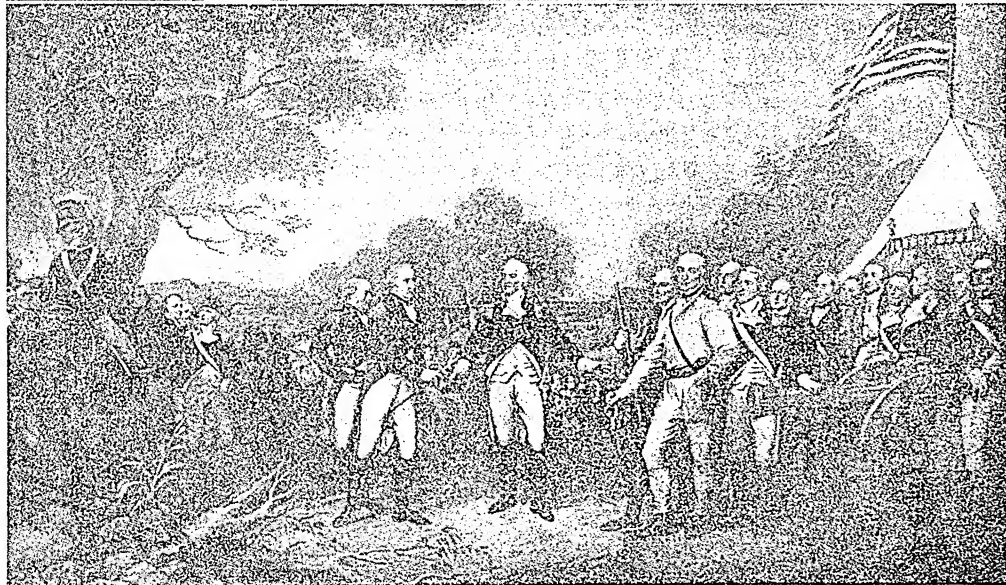
and of right ought to be, free and independent states." This Declaration of Independence was signed by the majority of the delegates, on August 2. Three signed later. John Hancock was the first signer.

Eight Years of War

Three Periods. The story of the war follows, in chronological order. At the close of the narrative, the individual battles are described, being listed in alphabetical order. It is convenient to divide the Revolutionary War into three periods. The first ends with the Declaration of Independence. From that day a new purpose actuated the colonies, for they had announced their freedom and knew they would have to unsheathe the sword to secure it. The troubled years through which the colonies had just passed had witnessed sincere efforts to avert a breach. Patrick Henry summarized those years when he said:

We have done everything that could be done to avert the storm which is now coming on. We have petitioned; we have remonstrated; we have supplicated; we have prostrated ourselves before the throne, and have implored its intercession to arrest the tyrannical hands of the Ministry and Parliament.

The days of uncertainty were ended; the Continental Congress and the people faced the future with stern resolution. George Washington had been summoned to the command of the American forces a year before, as a precautionary measure, but the army was a motley array which showed little strength. Washington and his aides never had a large army; it



Paintings of Revolutionary Scenes. At top, the "Battle of Lexington," by Harry Sandham. In the center, the "Battle of Trenton," by John Trumbull. Below, the "Surrender of Burgoyne," also by Trumbull.

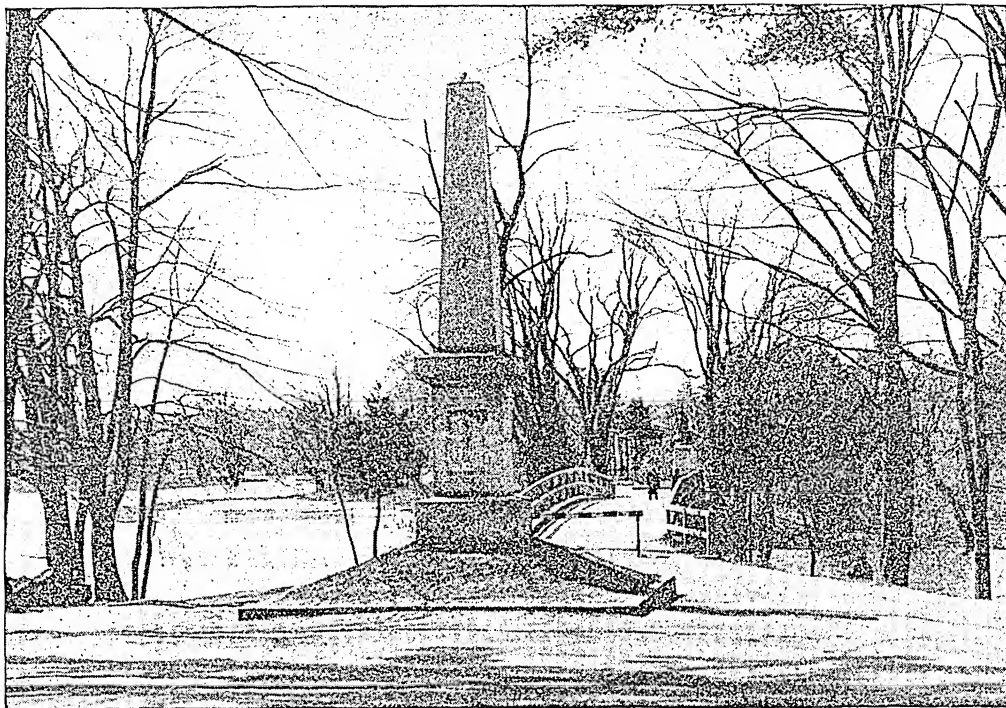


Photo: Wide World

WHERE THE "EMBATTLED FARMERS" STOOD

View of the Lexington-Concord bridge as it appears to-day. Here was fired the shot "that was heard round the world." In the foreground is the monument commemorating the Lexington engagement; at the farther end of the bridge is the statue of the Minutemen, valiant defenders of the narrow span. [Another illustration of the scene will be found on page 4526.]

averaged each year about 31,500 men, but at the lowest ebb in the tide of the new nation's fortunes, it was not greatly in excess of 3,000. Before the war, the colonists had used the English flag, making a few minor changes, but in the heat of the Revolutionary conflict, this emblem was scorned by the soldiers, who invented all sorts of banners to be carried into battle (see FLAG). A new American flag, credited to the designing skill of George Washington, Robert Morris, and Mrs. Betsy Ross, soon flew in evidence of the political separation from the mother country.

During the first period of the war, an expedition was sent to capture Quebec, and was entrusted to the leadership of Montgomery and Arnold. On December 31, 1775, they assaulted the city; Montgomery was killed, Arnold had his leg fractured, and the attack failed. Before the summer of 1776, the American forces were driven south to Lake Champlain. While this drama was being enacted, Washington drove the British out of Boston; they embarked for Halifax, from which point they returned later to take part in the campaign around New York.

Second Period. This division of the war covers the time from the Declaration of Independence to the entrance of France into the struggle, in May, 1778. Two sections of the

country were principal centers of activity during these two years. New York City and vicinity witnessed changing fortunes of war, and Philadelphia was the center of the campaign farther south.

When Howe evacuated Boston and went to Halifax, he remained there only long enough to learn the British plans. Soon his troops were reëmbarked and set sail for New York. Washington realized the importance of holding that city, for if it fell to the enemy, the British would control the Hudson River and might be able to cut off New England from the remainder of the country. Howe encamped on Staten Island, now the Borough of Richmond, and planned his operations. When ready, he captured Brooklyn Heights, in an engagement known as the Battle of Long Island. This was the key to New York's defense, and the British victory forced the hurried evacuation of the city, in September, 1776.

Washington crossed the Hudson and was steadily pursued southward through New Jersey, losing ground continually in the face of overwhelming numbers of his pursuers. Forts Washington and Mifflin were lost, and in November began one of the most famous and most masterly retreats in all history. Washington's only hope lay apparently in his ability to cross

the Delaware and get to Philadelphia; otherwise, his entire army might be captured. Sometimes the pursuers were so close that, when they entered a town, the pursued were just leaving it. By destroying bridges and leaving obstructions in the way, Washington got to Trenton ahead of his enemy, on December 8. Seizing every boat for miles up and down the river, he embarked his men, and the British, coming up, saw the last boatloads push out from shore.

Cornwallis, who commanded this chase, went into quarters at Trenton and at Princeton until he could build boats enough to put his army across to take Philadelphia. He did not anticipate attack, but on Christmas night, 1776, Washington recrossed the river, and in the morning surprised the enemy in a spirited attack. The Battle of Trenton was an audacious undertaking; the effect was as great as though it had been a victory won in a struggle on a vast scale, for it was the first ray of hope the country had received from its armies. The long retreat had discouraged the people and had almost bred treason in the army.

Cornwallis planned to hurl his forces upon Washington before the latter could get across the river again, but he lacked the proper initiative. Thinking he had Washington trapped on the night of January 2, he decided that he could afford to wait until morning and make an easy capture. The Americans, however, did not sleep that night. Hurrying inland, they surprised the garrison Cornwallis had left at Princeton in the preceding week, at daybreak on January 3, and completely routed the entire British line. These two victories destroyed the British plan of campaign and gave new courage to the Americans. Frederick the Great, Europe's greatest warrior, characterized the ten days' movement as the most brilliant in the history of warfare.

Howe left New York to march across New Jersey to capture Philadelphia; the Continental army, small but energetic, placed every conceivable obstacle in the way, and after several weeks spent in a vain effort to achieve his object, he returned to Staten Island. His next attempt to reach Philadelphia was by sea, but obstructions had been placed in the Delaware River, and his troops landed sixty miles from the city. The march toward Philadelphia was made difficult, but this time Howe was successful. He defeated the Continentals at Brandywine (September 11, 1777) and at Germantown (now a part of Philadelphia), three weeks later. Washington retired to Valley Forge for the winter, and the victorious Howe entered Philadelphia. At Valley Forge the Continental army endured incredible hardship because of a lack of even the barest necessities. This distressing condition was due to mismanagement by Congress.

A Decisive Battle. The British soon began a new line of attack in the north. Burgoyne was ordered to descend from Canada to take Ti-conderoga; another force, also from Canada, was to march on Albany. The two were to join and meet a force sent by Howe, from New York. Howe received his instructions too late, and was not a factor in the actions fought in September and October, 1777. In brief space of time, Oriskany, Fort Stanwix, Bemis Heights, and Saratoga told of the Continental army's determined resistance. Saratoga ended the campaign, for Burgoyne's army was captured. Creasy in his *Fifteen Decisive Battles of the World* calls Saratoga one of the few conflicts which have determined great issues; it was the turning point of the war, for France was convinced then that its aid should be extended to the struggling republic. Accordingly, an army and fleet were dispatched from France, and thereafter the French had an important part in the struggle. Lafayette was an inspiring leader who rendered invaluable service to the cause of the Americans.

Third Period. England was alarmed at the turn of affairs. Plans in the North had miscarried, by the surrender of Burgoyne; the brilliant turning upon the victorious British at Trenton and at Princeton had upset the campaign around Philadelphia; British officers reported to London that the colonies could not be conquered; the French alliance promised such formidable reinforcements that the task of England took on a most serious aspect.

Early in 1778, an English commission was empowered to treat for peace. The colonies were promised everything they had begged for in the years before, but every offer was rejected, and the war was pushed with new vigor and added enthusiasm. There were discouraging circumstances, however; the most serious internal trouble of the year was a plot, inspired by Conway, inspector general of the army, for the overthrow of Washington, who was to be succeeded by Gates, the winner of the Battle of Saratoga. The plan was discovered, and it came to naught. Baron Steuben was advanced to Conway's post; he exhibited the trait of German thoroughness, and made good soldiers out of the men who were offering themselves to the cause.

Sir Henry Clinton succeeded Howe in the spring of 1778. Knowing that the French fleet was coming, and fearing a blockade of Philadelphia, he evacuated that city and started to move his forces overland to New York. Washington followed and forced a battle at Monmouth (June 28). Here Charles Lee was disgraced for his poor attempt to fight; Washington ordered him to the rear, rallied the wavering regiments, and the British withdrew. Monmouth was the last battle of importance in the North.

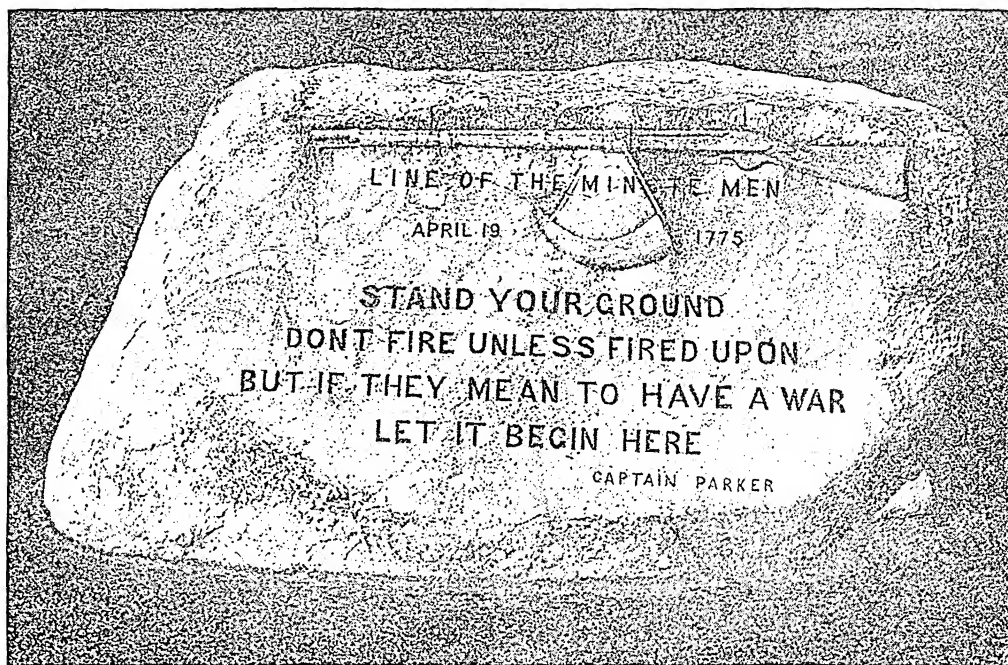


Photo: U & U

WHERE THE MINUTEMEN MET THE BRITISH

This stone, on the Common in Lexington, Mass., marks the spot where the American Minutemen met the British and fired the first shots of the war.

The Northwest. George III had decreed that the country between the Allegheny Mountains and the Mississippi River should be reserved for the Indians. The British held authority over the vast area by their forts at Detroit, Vincennes, Kaskaskia, and Cahokia. In 1778 George Rogers Clark undertook the task of winning the territory for the new nation which was slowly but surely making itself effective in the East. He had no authority except that of Patrick Henry, then governor of Virginia, who helped him to muster a group of hardy pioneers. Clark first took Kaskaskia, and in turn Cahokia and Vincennes. The British recaptured the latter, and Clark had to retake it (February, 1779). Only Detroit remained in English hands.

Naval Victories. In 1777, citizens of Portsmouth, N. H., built a small boat, the *Ranger*, which was turned over to privateering, under command of John Paul Jones. He added two other small vessels, and with this American "navy" he captured two British men-of-war so close to the English shore that thousands of people witnessed the battle.

Arnold's Treason. For ability and conspicuous service, Benedict Arnold had been commissioned senior major general of the Continental army. In 1779, while in command in Philadelphia, he was accused of irregularity and fraudulent dealings. A court-martial, called at his

own request, gave him no more severe a sentence than a reprimand from Washington, which was delivered in all kindness.

During the summer of 1780, he asked for and was given the post of commandant at West Point. He was bitter toward the cause of the states, because of the Philadelphia experience, and the appointment was sought that he might secure revenge. He planned to turn West Point over to the British. The plot was discovered; Major André, the English messenger in the undertaking, was caught and executed as a spy. Arnold escaped, and accepted a commission in the English army. He died twenty years later in London, without the respect of the English and despised in his native land.

Campaigns in the South. There were many more loyalists in the South than in the North, and the British hoped to win them actively to their cause by a demonstration in force. Therefore, English effort was transferred very largely to the South in 1778. Savannah was taken December 29, and Augusta fell soon afterward. In May, 1779, after a siege of six weeks, Charleston was taken. Feeling secure in possession, Cornwallis, then in command, warned the people to return to their former allegiance, threatening them with the fate of traitors if they refused. Local warfare between patriots and loyalists occupied many months. Gates was sent south to cope with the situation, and

before his troops were prepared, the Battle of Camden was fought. Camden was a British victory, and it ended Gates' military career.

The next serious effort in the South was an expedition sent by Cornwallis to intercept a retreat of Americans into North Carolina. A battle at King's Mountain, fiercely contested, was won by the Continentals, and it marked the turning point in the war in that section. Greene was sent to succeed Gates, and he had for aides Morgan and Marion. The British ordered Tarleton to punish the Americans for their victory at King's Mountain. The forces met at Cowpens, and Tarleton's defeat was so complete that he lost two-thirds of his men. The next engagement was at Guilford Courthouse; it was a British victory dearly bought, for it cost so many men he could not continue the offensive. The campaign in the South ended with the Battle of Eutaw Springs; it was an undecided engagement, but the Continentals were left in possession of the field, and the British retired to Charleston.

Cornwallis, who had returned north to rearrange his campaign, started south with a new force to offer aid to his armies there. The French entered Chesapeake Bay, effected a

junction with Washington, who had marched from the North, and the two forces engaged Cornwallis at Yorktown. From September 28 to October 18, 1781, they besieged the British; on the latter date, the English surrendered. The British knew the war was practically over, but fighting continued on an unimportant scale for several months. A provisional treaty of peace was signed before the close of 1782, and on April 19, 1783, exactly eight years after the Battle of Lexington, Washington issued an order declaring the war at an end.

The Treaty of Peace. The commission to agree upon terms of peace met in Paris, where on September 3, 1783, the final treaty was signed. The points secured in favor of the new nation were these:

- (1) Recognition of the complete independence of the thirteen states.
- (2) Location of the western boundary at the Mississippi River.
- (3) Permission granted to New England fishermen to fish in Newfoundland waters.

The American members of the peace commission were John Adams, Benjamin Franklin, and John Jay. E.D.F.

Most Important Battles of the War

Some of the engagements had little effect upon the progress of the struggle. The battles of note were the following:

Bennington, fought about five miles distant from the village of Bennington, Vt., on August 16, 1777. On that day nearly 2,000 "Green Mountain Boys" under John Stark defeated in succession two divisions of the British army commanded by Burgoyne, who had dispatched the troops to Bennington to seize a store of supplies. The English suffered a loss of over 200 killed and 700 captured; the Americans, only forty killed and forty-two wounded. The battle had results of first importance. It not only seriously weakened Burgoyne, but encouraged the colonial troops to continue their campaign against him, and his surrender two months later at Saratoga is generally regarded as the turning point in the war.

Brandywine, fought on Brandywine Creek, at Chad's Ford, Pa., September 11, 1777. Commanded by Washington, the American force of 11,000 met the British army of 18,000, under Howe. The British took the offensive, and after a stubborn fight, by a brilliant flank movement on the part of Cornwallis, the Americans were forced to retreat. The losses were 1,000 for the Americans and 600 for the British; the victory enabled Howe to enter Philadelphia.

Bunker, bung' kur, Hill, the first important battle of the Revolution. It was decisive, not because either side won a sharp victory, but because the steadfast stand of the colonial troops convinced the colonies that the contest with the trained soldiers of England, though unequal, would be by no means hopeless. Had the outcome been a real defeat for the colonists, it is possible that resistance to England might have then ceased.

This famous battle took place June 17, 1775, on Breed's Hill and Bunker Hill, Charlestown, Mass., between 1,500 Americans under Colonel Prescott and 3,000 British under Howe. The British troops holding Boston numbered about 10,000, while the colonials had no fewer than 15,000 in the neighborhood. Learning that the British were planning to fortify Bunker Hill to strengthen their hold on Boston, the Americans quietly occupied the adjoining height of Breed's Hill, and threw up an earthwork there during the night of June 16.

At daybreak the British discovered how they had been forestalled, opened fire from their ships in Charlestown Harbor, and later in the day landed a force to charge the hill. Up the slope in perfect order marched the British regulars, and no opposition met them until they were close to the redoubt, for Putnam had issued his famous command, "Don't one of you fire until you see the whites of their eyes," and it was obeyed. Repulsed by the sudden, fierce fire, the British fell back with great loss, but soon rallied for a second charge, which ended as did the first. Charlestown was burned to the ground by shells which fell into it during the engagement.

Both sides then rallied, and at 4:30 in the afternoon, a third charge took place. The Americans had used up all their ammunition, and were in consequence forced to yield after they had lost some of their bravest men, among them General Joseph Warren. All in all, the British had lost 1,054 in killed and wounded and the Americans 450; it was a costly triumph for the former, while for the latter it produced the effect of a victory.

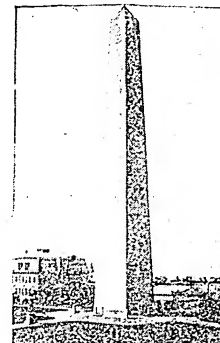
Bunker Hill Monument. This battle, so far-reaching in its effects, is commemorated by a monument which was dedicated in 1843. It is a granite shaft 221 feet in height, and stands, as nearly as can

be ascertained, on the spot where General Warren fell. Though it is on Breed's Hill, that height is now commonly known as Bunker Hill. On June 17, 1825, just half a century after the battle, Lafayette laid the cornerstone and Webster delivered an address; eighteen years later, at the dedication, Webster again gave one of his memorable orations. The monument cost over \$125,000, which sum was raised by popular subscription.

Germantown, an important engagement, fought on October 4, 1777, between the Americans under Washington and the British under Howe. Washington opened hostilities at daybreak and was at first

Gage had been appointed military governor of Massachusetts, which had been deprived of its charter, and whose principal port, Boston, had been closed by order of the king.

Gage's authority was never recognized by the colonists, and the work of arming the colonial militia for defense became necessary. In the spring of 1775, Gage was ordered to seize John Hancock and Samuel Adams, "arch traitors."



Photos: Visual Education Service

THE BATTLE OF BUNKER HILL AND THE PRESENT-DAY MONUMENT

successful; but in a dense fog, one American column mistook another for the enemy and opened fire upon it. The American troops were thrown into confusion, and a general retreat followed. Washington's courage in attacking the British so soon after the defeat at Brandywine led the hitherto undecided French court to form an alliance with the United States, and this fact gives to Germantown its historic importance. The town is now a part of Philadelphia.

Guilford, *gil' ford*, Courthouse, one of the last important battles of the war, fought on March 15, 1781. An American force had been recruited and placed under Nathaniel Greene; Cornwallis was in command of the British. Greene joined Morgan, who had defeated Tarleton, the leader of the British cavalry, and together they retreated into North Carolina. Cornwallis followed, but failed to overtake them at once, owing to Greene's excellent generalship. A battle was fought at Guilford Courthouse, near the site of the present city of Greensboro, N. C., in which the Americans were defeated, but Cornwallis lost about 600 men. He then decided to go to Virginia, while Greene marched back into South Carolina and drove the southern divisions of the British forces back to Charleston. Cornwallis soon saw that no gain could be made by the British, and wrote to Washington, asking what would be his terms of surrender.

Lexington, the first conflict of the Revolution, was fought on April 19, 1775, at Lexington, Mass., a settlement eleven miles northwest of Boston. Thomas

On April 18 he mustered 800 men, whom he ordered to march on Concord, seize the military supplies, then to arrest Hancock and Adams at Lexington. His plan was at once suspected by the members of the Boston League, one of whom, Paul Revere, rode from Charlestown to Lexington, rousing to arms the country along his route. Longfellow, in *Paul Revere's Ride*, describes this famous episode in graphic language:

So through the night rode Paul Revere;
And so through the night went his cry of alarm
To every Middlesex village and farm,—
A cry of defiance and not of fear.

When Gage's men reached Lexington, they found seventy militiamen confronting them. There the first shot of the Revolution was fired, and seven militiamen were killed. At Concord the British found most of the stores removed and a force of 400 men awaiting them. Although the English were reinforced by 1,000 men, they retreated toward Boston, losing 273 of their number.

Monmouth, *mon' muth*, an important battle fought near Monmouth Courthouse, at Freehold, N. J., on June 28, 1778, during one of the darkest hours of the war. On June 18, 1778, Clinton's British army left Philadelphia and retreated across New Jersey, while Washington with 8,000 men followed in the rear, in order to attack the left wing. General Charles Lee, with a force of 6,000 troops, was detailed by Washington to assail Clinton until



Photo: Keystone

Washington's Headquarters at Valley Forge. The building as it appears to-day, viewed by school children of this modern period.

6081

his arrival. Lee ordered an attack, but the assault was so mismanaged that his army was thrown into confusion and a retreat was begun. When Washington arrived, he personally took command, rallied the forces, and renewed the assault. After the day's battle was over, Clinton withdrew his army under cover of night to the heights of Middletown. Though the battle was indecisive, the advantage lay with the colonial forces. The American loss was 362 wounded and killed; the British loss, 416.

Princeton, a battle which revealed the superior generalship of George Washington, fought on January 3, 1777. This engagement, a victory for the Americans, was of great strategic importance. On the night of January 2, Lord Cornwallis, in command of a force of about 8,000 men, had taken a position on the west shore of the Assunpink River, a small creek south of Trenton, N. J. Washington, with a much smaller force, was encamped at Trenton. He could not retreat across the Delaware because the river was blocked with ice, so he resolved to take the offensive. Leaving his camp fires burning, to deceive the enemy, he led his army by a brilliant maneuver around the British, and at daybreak arrived on the outskirts of Princeton. Here a strong detachment of the army of Cornwallis came into conflict with the Americans, and after a brisk engagement, in which Washington revealed splendid personal bravery, the British withdrew, having lost over 300 in killed, wounded, and prisoners. Washington then seized the military stores at Princeton and returned to Morristown, where he established winter quarters. This battle, following the important victory at Trenton, greatly encouraged the Americans and inspired them to renewed efforts. Another important result was the withdrawal of all the British forces in New Jersey from that state into New York.

Saratoga, *sair a toh' gah*, two engagements fought on September 19 and October 7, 1777, in the vicinity of Saratoga Lake, New York. The second was called by the historian Creasy one of the fifteen decisive battles of the world. The two were important factors in a campaign planned by the British, the objects of which were the conquest of New York state, the crushing of Washington's army, and the separation of New England from the rest of the colonies. Three armies, under Burgoyne, Saint Leger, and Lord Howe, were to meet in the neighborhood of Albany and make a concerted effort against the Americans. Burgoyne marched from Canada by way of Lake Champlain in May, and on the thirteenth of September, crossed the Hudson River and took a position near Bemis Heights, where an American army under Gates was stationed. On the nineteenth, Burgoyne advanced with a force of 4,000 to attack the American left, but his army was intercepted at Freeman's Farm by 3,000 soldiers under Benedict Arnold, and an indecisive battle, lasting two hours, followed. Each side lost from 600 to 1,000 men. Because of the geography of the region, this engagement has been called the Battle of Freeman's Farm, the first Battle of Bemis Heights, the first Battle of Stillwater, and the first Battle of Saratoga.

In the meantime, Saint Leger had been so harassed by the Americans in the vicinity of Fort Stanwix that he had retreated to Lake Ontario, and Howe had been prevented by Washington from sending reinforcements to Burgoyne, or cooperating with him. The latter, too, found that his supplies were cut off, and he, therefore, decided to risk another battle. On October 7 he led a force of 1,500 against the

Americans, and was defeated in a battle in which Arnold took command of the colonial forces. The British retreated to Saratoga Heights, and there, on October 17, Burgoyne surrendered to General Gates the remnant of his army, about 6,000 men.

Ticonderoga, *ti kon dur o' gah*. One of the first movements in the war was the dispatch of an American expedition against Ticonderoga; on May 10, 1775, the fortress was captured by Ethan Allen without the loss of a man. When the British commander demanded of Allen by what authority he claimed its surrender, he uttered the now famous reply, "In the name of the Great Jehovah and the Continental Congress." The fort was retaken by Burgoyne's forces in 1777, but was later abandoned. In recent years, the fort has been restored.

Trenton, an American victory, of importance because it renewed the courage of the patriot forces and seriously disarranged the plans of the British. The battle was fought on the morning of December 26, 1776, about a month after Washington had begun his retreat across New Jersey. On December 8 he crossed the Delaware River, with the forces of Cornwallis in close pursuit. The British general then led his army to Princeton, stationing a force of Hessians at Trenton. On Christmas night, Washington recrossed the Delaware, in which blocks of ice were floating, and marched to the enemy's camp at Trenton. The Hessians, who were sleeping off the effects of a Christmas carousal, were completely surprised, and after a brief skirmish, the Americans captured nearly a thousand prisoners.

White Plains. This engagement occurred on October 28, 1776. Washington had evacuated Manhattan Island, and had brought the greater part of his forces to White Plains on the 23rd. Five days later, Howe sent a force of 4,000 men to attack the American outpost of 1,400, stationed on Chatterton Hill, on the west side of the Bronx River. After a spirited engagement, the Americans withdrew to the main camp, losing about 140 men. Later, Washington took up a position at North Castle.

Yorktown, Siege of. Yorktown, the county seat of York County, Va., has twice figured prominently in American history—in 1781 and in 1862. The first siege was especially noteworthy, because it brought to a close the Revolutionary War. Cornwallis, with his army of 8,000, took possession of the town in August, 1781, and fortified it strongly; and on September 28 Washington arrived before the walls with his force of 16,000 men, while a French fleet cut off the aid which Cornwallis had expected to receive from British vessels anchored in the York River. The American forces threw up their defenses, and on October 9 the bombardment began, Washington himself touching off the first cannon. The firing continued for more than a week, and on October 19 Cornwallis was forced to surrender. This was the last real battle of the war. In 1881 an elaborate monument was erected to commemorate Washington's victory. The 150th anniversary of Cornwallis' surrender was celebrated in 1931. See page 7621.

Related Subjects. The reader is referred to the following articles in these volumes:

HISTORICAL ARTICLES

Boston Massacre	Declaration of Independence
Boston Port Bill	Flag (United States Flag)
Boston Tea Party	Green Mountain Boys
Cabal (Conway Cabal)	Hessians
Committees of Correspondence	Intolerable Acts



Photo: Visual Education Service

WASHINGTON CROSSING THE DELAWARE
[From the painting by Leutze.]

Paris, Treaties of
Stamp Act

United States (History)
Writs of Assistance

BIOGRAPHIES

Adams, Samuel
Allen, Ethan
André, John
Arnold, Benedict
Burgoyne, John
Carleton, Sir Guy
Clark, George Rogers
Clinton, George
Clinton, Sir Henry
Cornwallis, Charles
De Kalb, Johann, Baron
Franklin, Benjamin
Gage, Thomas
Gates, Horatio
Greene, Nathanael
Hale, Nathan
Hancock, John
Henry, Patrick

Howe (Richard and Sir
William)
Jones, John Paul
Lafayette, Marquis de
Lee, Charles
Lee, Henry
Lee, Richard Henry
Marion, Francis
Otis, James
Pickens, Andrew
Putnam, Israel
Revere, Paul
Ross, Betsy
Stark, John
Steuben, Baron von
Warren, Joseph
Washington, George
Wayne, Anthony

usage, was an American, Samuel Colt, of Hart-
ford, Conn., in 1835 (patent granted in 1836).

Around 1900, the automatic pistol, a weap-
on which has in a large measure superseded
the revolver for military purposes, came in-
to common use. In the pistol, the cartridges
are ordinarily fed from a detachable magazine
inserted into the hollow handle or stock of
the arm, the ejection of the empty fired case
and the insertion of a fresh cartridge being
accomplished through the employment of some
of the energy developed by the recoil in-
cident to firing. In a revolver, on the con-
trary, fresh cartridges are brought into po-
sition through the rotation of the cylinder,
either as the result of cocking the hammer
(or firing mechanism) by hand, or through
a rearward pull on the trigger. Weapons
cocked by hand only are said to be of the
"single action" type, whereas those cocked
by the trigger are known as "double action."

Modern revolvers commonly employ rimmed
ammunition loaded with either black or smoke-
less powder and containing plain lead or
metal-jacketed bullets, often incorrectly called
steel-jacketed bullets. No steel-jacketed bullets
are manufactured in America, an alloy of cop-
per and zinc (95 per cent and 5 per cent) or-
dinarily being used instead. Some foreign am-
munition is steel-jacketed.

Automatic pistols (above .22 caliber) employ
rimless cartridges loaded with smokeless pow-
der only, and with partly-jacketed or full-
jacketed bullets. Plain lead bullets are not
used in weapons of this type in calibers larger
than the .22.

C.G.

REVOLUTION OF 1688. See ENGLAND,
page 2260.

REVOLUTION OF 1848. See FRANCE,
page 2584; BELGIUM, page 698; GERMANY,
2785.

REVOLVER, a hand firearm which has fig-
ured prominently in the recent history of
civilization. In its simplest form, it con-
sists of a fixed barrel and a revolving cyl-
inder so located as to bring successively
into alignment with the rear of the barrel
a series of charges contained within a vari-
able number of chambers evenly spaced about
its axis. The idea of such a weapon is very
old, and flintlock, wheel-lock, and even fire-
lock revolvers were not unknown, but the first
person to design a revolver simple and rugged
enough to function continuously under hard

REXFORD, EBEN EUGENE (1848-1916), an American poet and writer on gardening subjects, but best known as the author of *Silver Threads Among the Gold*. He was born in Johnsbury, N. Y., and spent most of his life in Wisconsin. He was a graduate of Lawrence University, at Appleton. He was prominent in social and philanthropic work.

REXFORD'S BOOKS. Among his works are *Brother and Lover*; *Pansies and Rosemary*; *Home Floriculture*; *Grandmother's Garden*; *Flowers—How to Grow Them*; *Four Seasons in a Garden*; *The Home Garden*; *The Indoor Garden*; *Amateur Garden Craft*.

REYKJAVIK, ra' kyah veeh, capital city of Iceland (which see).

REYNARD, ra' nurd, the red fox of Europe. See Fox.

REYNOLDS, ren' uldz, SIR JOSHUA (1723-1792), one of England's masters of portrait painting, sometimes called the "Van Dyck of the Eighteenth Century." It is said that he painted between 2,000 and 3,000 portraits; among his patrons were beautiful women of society and men prominent in art, literature, and politics. He had the gift for conveying to the canvas the individuality of his subject, and so his portraits are wonderfully lifelike, though the drawing is often faulty. He was a master of color, but his fondness for experimenting in this field had unfortunate results, for many of his best works are badly faded.

Reynolds was the son of a rector and schoolmaster of Plympton, Devonshire. At the age of eighteen, he began studying with a prominent portrait painter, and two years later started on an independent career. A sojourn of three years in Italy, the land of art, proved of great value to the talented young man, and by 1752 his reputation was firmly established. In 1768 he was elected first president of the Royal Academy, was knighted by King George III, and in 1784 became painter to the king. He founded the famous Literary Club, of which Samuel Johnson, Boswell, Burke, Sheridan, Goldsmith, Garrick, and other literary men were members (1764), and he painted all of these celebrities. He was an intimate friend of Johnson (which see).

SUMMARY OF HIS WORK. The National Gallery of London possesses a number of the best of Reynolds' canvases, including portraits of Goldsmith, Dr. Johnson, Garrick, and Admiral Keppel. Three

portraits of himself are also in this collection. *Mrs. Siddons as the Tragic Muse*, which is considered his best portrait, *Sacrificing to the Graces* (see next page), and other pictures are in smaller galleries or private collections. In America many fine examples of his work are housed in the Metropolitan Museum, in the New York Public Library, and in several private collections. Reynolds wrote an admirable series of treatises on the history of art, which are collected under the title *Discourses before the Royal Academy*. A copy of "Simplicity," by Sir Joshua Reynolds, is in the article PAINTING, opposite page 5301.

RHEA, re' ah, in classic mythology, a goddess who was the symbol of the productiveness of nature. She was often given the name of "Mother of the Gods." Rhea was the daughter of Uranus and Gaea, or Heaven and Earth. In Phrygia, a division of Asia Minor, Rhea was identified with Cybele, who presided over mountain fastnesses and fortified places. She was attended by priests called Curetes, and her chariot was drawn by lions. Rhea cured Bacchus of madness, taught him her religious rites, then sent him forth to teach the cultivation of the vine.

RHEA, in botany. See BOEHMERIA.

RHEA, a large bird which is popularly called the "South American ostrich," because of its similarity to the ostrich. Scientists, however, have noted many points of difference, and the two groups are placed in separate families. The ostrich has two toes, without claws; the rhea three, with claws. The rhea's head and neck are not so bare of feathers; though its wings are useless for flight, they are much more developed than those



Photo: Brown Bros.

SIR JOSHUA REYNOLDS



THE RHEA

of the ostrich. Finally, this bird is only about half the size of the ostrich, for it stands not more than three feet in height.

The rhea is not found north of the equator, but is numerous on the plains of Southern



Courtesy of The Art Institute of Chicago

PORTRAIT, BY SIR JOSHUA REYNOLDS, OF LADY BUNBURY "SACRIFICING TO THE GRACES"

Brazil, Uruguay, Paraguay, and Northern Argentina. It is of some commercial importance; its plumes, much inferior to ostrich plumes, are made into brushes, and its skin is manufactured into a native rug. Rheas are polygamists. One male appropriates two or more females; the latter lay their eggs in the same nest, and when the number reaches twenty to twenty-five, the male assumes the task of hatching them. The birds live in communities of a dozen to twenty, and eat worms, snails, berries, seeds—anything small in the animal and vegetable kingdoms. The common local name of the rhea is *nandu* (*nan' doo*). See OSTRICH.

D.L.

Scientific Name. Rheas constitute the genus *Rhea* of the family *Rheidae*. The common species is *R. americana*.

RHEIMS, OR REIMS, *reems* (French, *raNs*). See REIMS.

RHENIUM. See CHEMISTRY (The Elements).

RHEOSTAT, *re' o stat*, a device for regulating and controlling the amount of electric current by interposing various resistances. See ELECTRICITY; RADIO COMMUNICATION (Glossary of Radio Terms).

RHETORIC, *re' o rik*. During all his school years, from the primary school to the university, the student is receiving instruction, more or less formal, in the use of his mother tongue. In the early grades, he has "language" lessons, through which he learns, half unconsciously, to express himself freely in speech and to set forth some of his thoughts in writing. Then follows grammar, in which the student learns the "why" of many of the things he has been told to say or not to say, and in which increased emphasis is placed on composition, or written exercises.

Further study into this most interesting subject of oral and written expression makes clear the fact that fluent expression or even grammatical expression is not the sole aim. That the words used, the sentence structure chosen, the figures of speech introduced, may be such as to convey in the very best possible manner a certain thought—that is the final goal. To teach such a correct method of conveying the thought is the province of rhetoric. Strictly speaking, rhetoric concerns itself merely with *spoken* language, while the closely related subject, *composition*, deals with written language; for the word *rhetoric* is derived from a Greek word meaning *orator*. But in its commoner sense, it includes everything pertaining to the art of communication, whether written or spoken.

The person who has mastered rhetorical principles will not use poetic, flowery language in a business letter; he will not use in a simple after-dinner speech the balanced phrases and the dignified, sonorous sentences which might

be perfectly in keeping with a formal address on a lofty subject; he will not treat a serious subject in flippant, colloquial style; but he will strive always to make the manner of expression fit the topic, that his hearers and readers may feel in the very words his attitude toward his subject.

Related Subjects. The reader is referred in these volumes to the following articles:

Climax	Metaphor
Figure of Speech	Metonymy
Grammar	Oration
Language	Personification
Literature	Simile

RHEUMATISM, *roo' mah tiz'm*, a term used to designate a group of disorders of the joints, most of which are inflammatory and the result of infection. There are two great groups of rheumatisms, acute and chronic. Acute inflammatory rheumatism, also called *rheumatic fever* and *acute articular rheumatism*, is an acute inflammation of a large joint due to infection with a coccus. It is characterized by pain, tenderness and swelling of the joint, fever, rapid pulse, a general aching, and profuse sweats. The inflammation has a tendency to jump from one joint to another, and to get better and then relapse. In the majority of the cases of acute articular rheumatism, the heart is involved from the beginning of the disease, and much organic heart disease is caused by this form of rheumatism. Sore throat is very apt to accompany rheumatism. The other acute forms of rheumatism are due to infections with cocci closely akin to the pus cocci.

Prevention. It is important to prevent rheumatism, both on account of the illness itself, and because of the danger to the heart from the disease. The teeth, tonsils, and throat should be kept in good condition. If there is any source of infection elsewhere, it should be cleared up. Exposure to chilling and wetting should be avoided.

Treatment. The afflicted joint should be wrapped well and kept warm. Salicylates are given to relieve the pain. The heart must be watched.

Muscular Rheumatism. This is a form of acute rheumatism which affects one or more muscles. If it is located in the back muscles, it is called *lumbago* (see LUMBAGO). If in the neck muscles, it may be called *wryneck* or *stiff neck*.

Chronic Rheumatism. There are several forms of chronic joint diseases that go by such names as *rheumatoid arthritis*, *arthritis deformans*, and *chronic rheumatism*. In all probability, included under the head of chronic rheumatism are several disorders, unrelated except that all of them affect the joints. Some are caused by infected tonsils or teeth, or infection elsewhere in the body. It is possible that in this large group there are some cases that are caused by dietary errors. In these dis-

orders, the joints are deformed and stiffened. In some of them, the heads of the bone are enlarged. The chronic rheumatism is generally slowly progressive; they get better and worse, but in the long run, the tendency is toward the worse rather than the better.

Treatment. If a focus of infection can be found, it should be removed or otherwise treated. In some instances, living in a warm, dry climate is helpful. The bowel habits should be kept regular. Some benefit may follow dieting, but this must not bring on under-nutrition. In some cases, hot baths, massage, passive motion exercises, and treatments with heat are helpful.

Historical. Joint affections were one of the first disorders that arose to plague man. The bones of Indians and Mound Builders show that these primitive peoples suffered from some varieties of rheumatism, as did the Egyptians whose bodies were mummified. The skeletons of man and animals found in the caves of Europe show that the cave man and the animals of the period all were crippled at times from some forms of rheumatic disorder. W.A.E.

RHEUMATOID ARTHRITIS, *roo' mah toid ahr thri' tis*. See RHEUMATISM.

RHINE OF AMERICA, a term applied to the Hudson River (which see).

RHINE, *rine*, **RIVER** (RHEIN in German), the stream which might be called Germany's national river, and one of the most important in Europe. It was written of by Lord Byron as the—

wide and winding Rhine,
Whose breast of waters broadly swells
Between the banks which bear the vine,
And hills all rich with blossom'd trees,
And fields which promise corn and wine,
And scatter'd cities crowning these,
Whose far white walls along them shine.

To Germans, the Rhine is the symbol of their national existence and strength. Thus, in Wagner's operas, the possession of the Nibelungen ring, fashioned from the gold guarded by the maidens deep down in the clear Rhine waters, gave to its possessor power over all the world. So, too, in the legends from which Wagner drew his story, the hero Siegfried made himself invulnerable by bathing in the blood of the dragon who had his abode in the Dragon Rock (*Drachenfels*), a hill still pointed out to travelers down the Rhine as they approach the university city of Bonn. But the meaning of the Rhine to Germans is best shown in their national anthem, *The Watch on the Rhine*:

Rest, Fatherland, for sons of thine
Shall steadfast keep the Wacht am Rhein.

The Rhine in History. The Rhine has figured in German history ever since Caesar built his timber bridge and wrote that description of it which tries the patience of so many boys and

girls in the study of Latin. For four centuries the Rhine was the boundary between the Romans and the barbarian tribes, except for a short time when the emperor's legions pushed on to the Main. On the west bank grew up Roman cities—Cologne (*Colonia Agrippina*),



COURSE OF THE RHINE

Bonn (Bonna), Coblenz (Confluentes), Mainz (Maguntiacum), Worms (Borbetomagus), Speyer (Noviomagus), Strassburg (Argentoratum)—all in Germany, and Basel (Basilia) in Switzerland, but the east bank remained thoroughly German. In the Middle Ages, the Rhine from Basel to the Netherlands was under German rule, but when France gained a meager foothold on its western shore, at the close of the Thirty Years' War, in 1648, a struggle began which has lasted to our own time. Louis XIV made gains, and Napoleon restored the old Roman boundaries of France. Even after Napoleon's fall, Alsace, which borders the Rhine from Switzerland to beyond Strassburg, was left in French hands, but it was wrested from their grasp in 1870 by Germany, only to be once more battled over in World War I. The Treaty of Versailles returned Alsace and Lorraine to France, again extending that country's domain to the Rhine.

Under the Treaty of Versailles, the inter-allied forces took possession of the left bank of the Rhine and the bridgeheads for a period of fifteen years, with the understanding that, if Germany fulfilled its obligations faithfully, the Cologne zone would be evacuated in five years, and the Coblenz zone in ten. The left bank and an area about thirty miles wide, on the right bank, were to remain unoccupied by military forces.

The army of occupation which policed this territory consisted of the British, centered at Cologne; the Belgians, to the north of them;

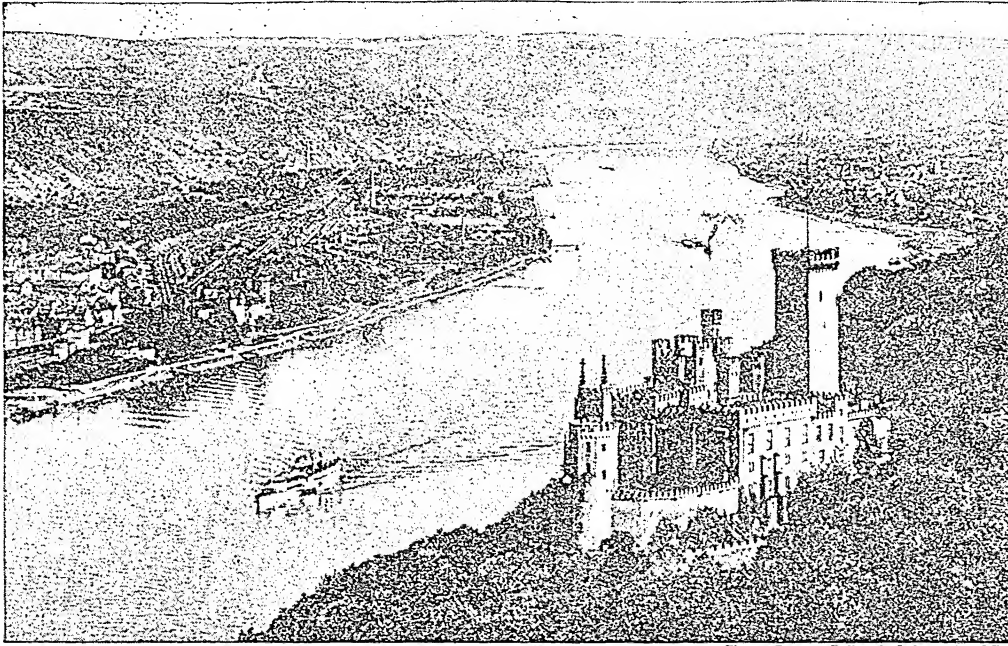


Photo: German Railroads Information Office

THE RIVER RHINE, SHOWING STOLZENFELS CASTLE

Along the Rhine, which Walt Whitman once called "the most beautiful river in the world." Stolzenfels Castle is one of the remnants of medieval times. Wooded hills crown both banks of the river.

and the French, to the south of them. Although Coblenz was occupied by American troops until January 10, 1923, civil administration of this area remained in the hands of the Germans.

France and Belgium attempted to set up a buffer state between Germany and the former countries. In 1923, when Germany declared her inability to pay as required by the Reparations Commission, France and Belgium occupied the Ruhr on the right bank of the Rhine, withdrawing after adoption of the Dawes Plan for a sliding scale of payments. In 1936, German troops moved into the demilitarized Rhineland zone and Germany resumed full military control.

The Course of the River. In the eastern end of Switzerland, close to the Italian border, two glacier-fed mountain torrents start northward. One is the *Vorderrhein*, or Hither-Rhine, the other the *Hinterrhein*, or Farther-Rhine. From their union, the Rhine hurries along the edge of Austria and the miniature state of Liechtenstein to Lake Constance (1,306 feet above the sea), which frees it of its mountain mud and sends it westward, a deep, transparent green, to tumble over a fall of seventy feet at Schaffhausen, thence to wind between Baden and Switzerland to Basel. There the stream, now 225 yards wide, turns sharply to the north. It receives tributaries from every Swiss canton except Geneva.

When it turns toward the North Sea, the Rhine flows between the Black Forest on the

right and the Vosges Mountains on the left. Though it can be navigated at this point, its current is so swift that boats use the Rhine-Rhine Canal as far as Strassburg. From Basel the river gradually opens until it is about a half mile wide, but suddenly plunges into a narrow gorge at the town made famous by Mrs. Norton's poem of the "soldier of the Legion" who was "born at Bingen, fair Bingen on the Rhine." From here to the Dragon's Rock, as in the famous description from *Childe Harold*,

The river nobly foams and flows,
The charm of this enchanted ground,
And all its thousand turns disclose
Some fresher beauty varying round.

There are peaks crowned with ruined castles, once the strongholds of robber barons who forced their toll from every boat that passed; there is the rock where sat the Lorelei immortalized by Heine, the maiden "of wondrous form and fair," who lured the unwary to destruction with her wild melody; there are dozens of hills around which center legends of Attila the Hun, the heroic Roland, and other historic or mythical figures.

To Holland, normally, the Rhine spells neither tradition nor present-day inspiration, but only commerce. Entering the Dutch realm, the river is lost in a delta, the main stream of which flows into the Meuse and gives to the ships of Rotterdam the opportunity to steam up to Düsseldorf, Cologne, Coblenz, Mainz, Frank-

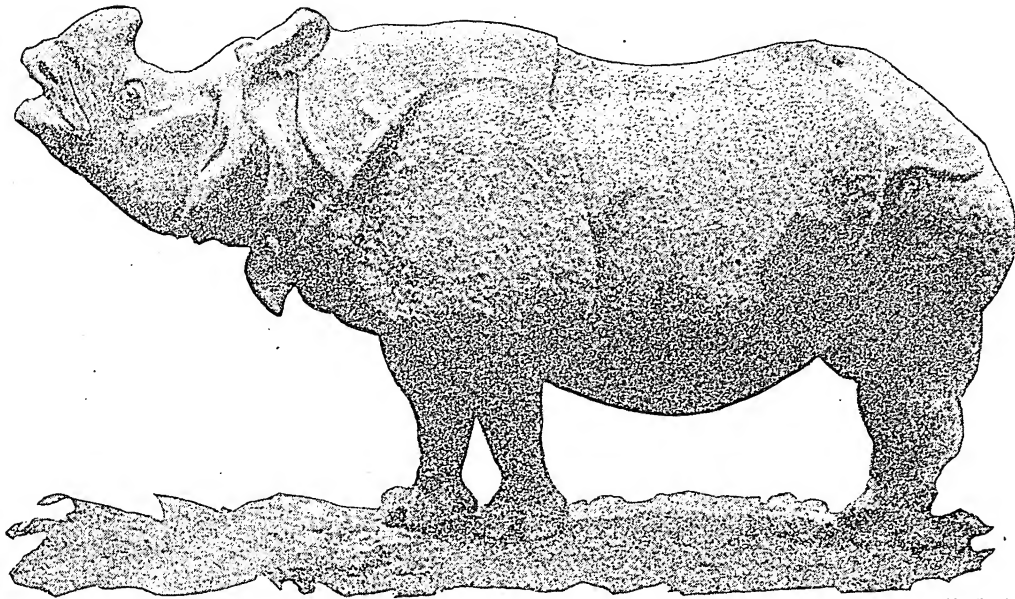


Photo: Wide World

THE INDIAN RHINOCEROS

The African type, differing little in other respects, has two horns.

fort-on-the-Main, Mannheim, and Strassburg, and to share in the trade of those great cities.

The Rhine drains an area estimated at over 75,700 square miles. Its total length is about 850 miles. It is connected with the Danube by the Ludwig's Canal, and two canals unite it with the Rhone, and thus with the Mediterranean. On the north, a canal unites it with the Yssel Lake at Amsterdam. See LORELEI; MOUSE TOWER.

RHINOCEROS, *ri nos' ur os*. This huge, ungainly animal is one of the largest of land creatures. Only the elephant and hippopotamus exceed it in size; an adult rhinoceros weighs from 4,000 to 6,000 pounds. In appearance the rhinoceros is grotesque, with its immense solid body, short, clumsy legs, thick, loosely hanging, almost hairless skin, and its one or two slightly curving horns projecting from the long nose. The name, from two Greek words, means, literally, *nose-horned*.

The animal has three toes on each foot, each toe encased in a separate hoof. On each of the front feet there is a fourth rudimentary toe. In this respect the rhinoceros differs from the hippopotamus, which has four regular toes. The latter is related to the hog, while the rhinoceros is more nearly akin to the horse.

The rhinoceros feeds on grass and roots, leafy twigs, and shrubs; in captivity, which it endures well, it is very fond of bread, fruits, and sweets. The animals are found to-day in a wild state only in Africa, in Southeastern Asia, and on a few large islands near the Asiatic coast, but in ages long past, they also

roamed over Europe, North America, and Northern Asia.

Kinds of Rhinoceros. There are five distinct species. The rhinoceros most often seen in parks and in menageries is the *Indian rhinoceros*, the largest of the Asiatic species. It stands well over five feet high at the shoulder, and has one great, blue-black horn, very thick at the base and usually about one foot long. Its skin hangs in such definite folds that the huge beast looks as though it were encased in armor plate. Yet the thick hide is very sensitive, and can be pierced by a knife or bullet. The animal lives among jungles and dense growths of reeds and grass, on which it feeds at night, while by day it frequents the marshy borders of rivers and lakes. This rhinoceros was well known to the ancients of Oriental countries, and was even used in the games of the circus in Rome before the time of Christ. Specimens have become so rare that they are now protected by law.

There is a similar, but smaller, one-horned rhinoceros, which ranges from Bengal into Burma, and southward to Java and Borneo. There is a Sumatran species which is very small and quite hairy, and there is a variety of this species which is distinguished by its hairy ears.

The two African species, both two-horned, are known as the *black* and the *white rhinoceros*, although they are almost exactly the same bluish-gray color. *Long-lipped* and *square-mouthed* are better designations. The black rhinoceros uses its first horn, which is

sometimes as much as three and one-half feet long, for attacking and defending itself and for digging. So strong is this horn that the animal easily uproots and overturns bushes and small trees with it, that it may more conveniently feed on the foliage. In size and habits, the black rhinoceros much resembles the Indian species, although it is much more savage. It remains concealed by day, and wanders about at night in search of food and water. The white rhinoceros, more northerly and now nearly extinct, is even larger than the black.

Hunting the Rhinoceros. The Indian rhinoceros, because it lives in jungles and thickets of grass and reeds that sometimes grow to a height of twenty feet, can be hunted only with elephants. Sometimes it is tracked to its lair with a single elephant; sometimes a hunter, following the well-beaten track to a drinking place, will surprise it wallowing shoulder deep in a mudhole. It is more common, however, to beat the animal out with a line of elephants, stationing hunters at intervals along the edge of the jungle to shoot it when it breaks from cover. While this species is believed to be quiet and inoffensive unless provoked, it turns very savage under attack and fights furiously, using its horn occasionally, but more often attacking with its long, sharp teeth. It is difficult to kill because its skin, though sensitive, is very thick; for this reason, hunters invariably use steel-tipped bullets. The African rhinoceros is hunted by the natives for food, and by the big-game hunters for sport. In spite of its apparent clumsiness, it moves swiftly; for a short distance, it can run as fast as a horse.

Rhinoceros Bird. The rhinoceros has no enemies except man and the insects and vermin

which infest the tender places concealed by the thickly folded skin. It gets relief by wallowing all day in the mud and by making friends with a little bird, about the size of a thrush. This so-called *rhinoceros bird* perches on the animal's head or broad back, devouring the insects which torture the huge beast. It is believed that these birds warn the rhinoceros of approaching danger, because they have frequently been observed running about the animal's head, flapping their wings, and uttering shrill, warning notes, which the beast seems to understand.

W.N.H.

Scientific Name. The rhinoceros belongs to the family *Rhinocerotidae*. The Indian rhinoceros is known to scientists as *Rhinoceros unicornis*; the Javanese as *R. sondaicus*; the Sumatran as *R. sumatrensis*; the black as *R. (or Dicerus) bicornis*; the white as *R. simus*.

RHINOCEROS BEETLE. See HERCULES BEETLE.

RHINOCEROS IGUANA, a type of lizard so named because of the three conical horns on its snout, and its general grotesque appearance. Relatively scarce, this species of iguana (which see) is found only in Puerto Rico and Haiti. It averages about four feet in length, and feeds on young chickens, rats, and other small animals and on various fruits, vegetables, and flowers. Though it is wild and vicious when captured, the rhinoceros iguana is easily tamed. It is also known as the *horned iguana*.

Scientific Name. *Melopoceros cornutus*; family, *Iguanidae*.

RHIZOME, *ri' zome*, an elongated, horizontal, rootlike portion of the stem of several springtime plants. See BULB.

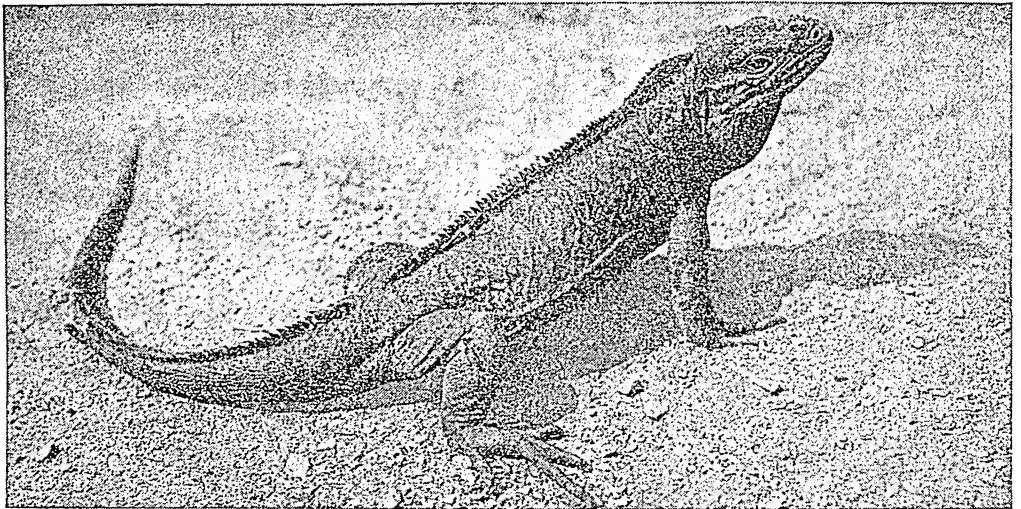
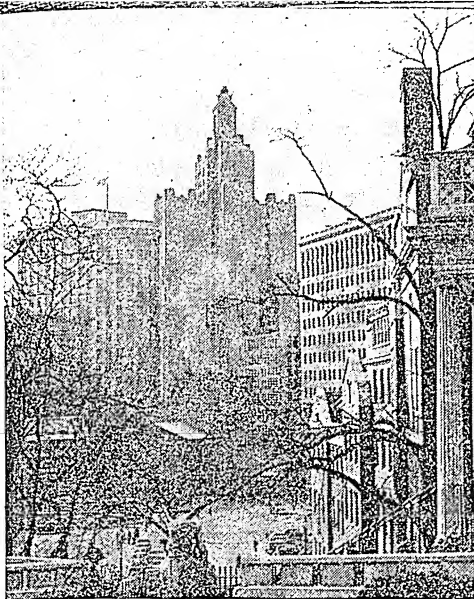
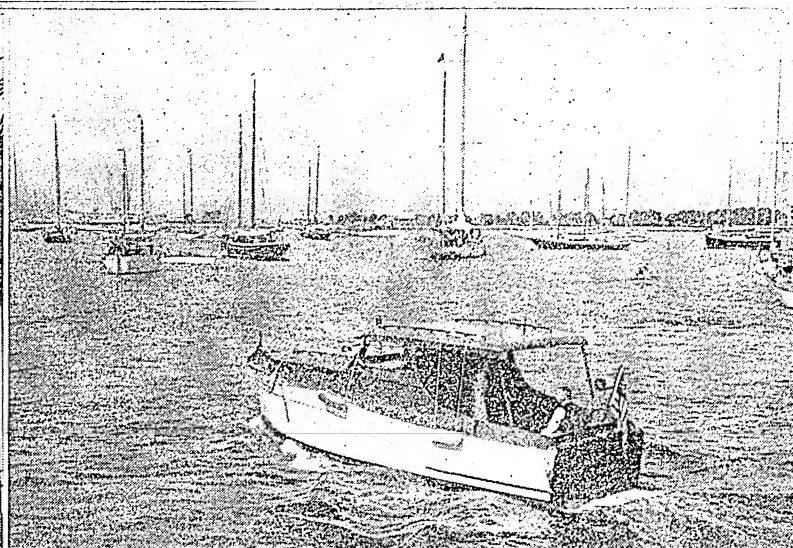


Photo: N.Y. Zoological Society

THE RHINOCEROS IGUANA



Photos: F.P.G.



RHODE ISLAND LITTLE RHODY

RHODE ISLAND,* *rohd i'land*, takes its name from that of an island in Narragansett Bay, called Aquidneck by the Indians but later changed to Rhode. According to some historians, Giovanni da Verrazano, the Italian explorer, suggested the name because the island resembled the famous isle of *Rhodos* (Island of Roses) or Rhodes in the Mediterranean Sea. Others credit it to Roger Williams, who said, "Rhode Island, like the Greek island of Rhodes, is an isle of roses." Still others think it comes from *Roodt Eylandt* (Red Island), which Adriaen Block, the Dutch navigator, named the region because of the "fiery aspect of the place, caused by the red clay in some portions of its shores." The popular nickname, **LITTLE RHODY**, comes from the fact that Rhode Island is the smallest state in the Union.

Rhode Island is so small that 220 states of the same size could be set down inside Texas and still leave room to spare. An airplane traveling four miles a minute could fly across its greatest length in about twelve minutes. Yet Rhode Island is the most densely populated state in the Union, with more than twenty-eight times as many persons to the square mile as has Texas, and more than fifteen times as many as the United States as a whole. Two of its five counties, Providence and Bristol, have more than one thousand inhabitants to the square mile. Rhode Island also has the highest percentage of urban population of any state, with more than ninety-one out of every one hundred persons living in a city or sizable town.

In spite of its smallness, Rhode Island has played a great part in the history of America. More than three hundred years ago, it became a cradle of religious freedom in the New World, as well as a haven for those who sought freedom of speech, of assembly, and of the press. Its colonial charter of 1663 was a forerunner of the American Bill of Rights. It was the first of the thirteen colonies openly to defy Great Britain. This belief in independence of thought and

action is now symbolized by the statue of the Independent Man which tops the capitol at Providence.

Rhode Island is also the birthplace of the industrial revolution on the western hemisphere. It was here that the first successful power cotton spinning jenny in America was put into operation in 1790. Today, it is the most highly industrialized area in New England, leading all the states of the Union in the per capita wealth from manufactures. The spindles and looms of its huge textile mills supply woolen, worsted, cotton, rayon, lace, and knitted goods. From its shops come vast supplies of machinery and precision tools. In Providence, one busy plant manufactures more silver and church ware than any other in the world. The American jewelry industry was started in Rhode Island by one of its early settlers, and the state now leads the nation in the manufacture of medium- and high-priced jewelry.

Along the shores of Narragansett Bay, fine power yachts and sailboats are built, and millions of tons of water-borne coastwise shipping are handled each year. From its waters come the fish, lobsters, oysters, and clams for its famous clambakes and shore dinners, and for sale in many markets. The state is also famous for its summer resorts, including Block Island, with its hardy fisherfolk, and internationally known Newport, with its palatial estates, silver beaches, and picturesque cliffs.

The Land and Its Resources

Extent: *Area*, 1,214 square miles (156 square miles of which are inland water; in addition, there are 14 square miles of Atlantic coastal waters); forty-eighth in size among the states. *Greatest length*, 43 miles; *greatest width*, 37 miles. *Coast line*, 54 miles (including islands).

Physical Features: *Elevation*, highest, Durfee Hill, 805 feet, in the northwest; lowest, sea level, along the coast. *Chief bays*, Bristol Harbor, Greenwich, Little Narragansett, Mount Hope, Narragansett. *Chief salt-water "rivers,"* Barrington, Kickemuit, Pettaquamscutt, Providence, Sakonnet, Seekonk, Warren. *Chief rivers*, Blackstone, Moshassuck, Pawcatuck (chief tributaries, Queens and Wood), Pawtuxet, Woonasquatucket. *Chief lakes, ponds, and reservoirs*, Great Salt, Pascoag, Scituate, Wallum, Watchaug, Worden. *Chief islands*, Block, Conanicut, Dutch,

*For map and map data of Rhode Island, see MASSACHUSETTS (map).

Dyer, Gould, Hog, Hope, Patience, Prudence, Rhode, Rose.
 Climate: *Temperature*, average annual, 50.1°; average summer, 69.7°; average winter, 30.1°; lowest on record, -22° at Kingston (Feb., 1934); highest on record, 102° at Greene (July, 1926). *Precipitation*, average annual, 38.28 inches; average Apr. 1 to Sep. 30, 19.19 inches; average Oct. 1 to Mar. 30, 19.09 inches. *Snowfall*, average annual, 31.7 inches.

Location and Surface Features. Rhode Island is skirted on the south by the Atlantic Ocean. The general coast line is only a little more than fifty miles long, but if the shores of its many indentations are considered, there are more than 360 miles of inlying coast washed by tidewater. The largest of these indentations is Narragansett Bay, which extends inland for a distance of twenty-eight miles and varies in width from three to twelve miles. This large, irregular body of water with its many smaller bays and arms, cuts the state into two parts, the western being the larger. In its sparkling waters lie several important islands, the largest of which are Rhode, Conanicut, and Prudence. About ten miles off the Atlantic coast may be seen the dim outlines of Block Island, covering about fifteen square miles. If its houses and steep hills show up clearly, you may be sure, say old inhabitants, that rain will fall before three o'clock the next day. For the boundaries of Rhode Island, see MASSACHUSETTS, colored map.

Along the ocean, from Point Judith westward, the coast is lined with sandy beaches, sandspits, and peninsulas, practically cut off from the mainland by shallow landlocked salt marshes and ponds. The shores of the islands in the bay, and of the narrow strip of mainland which fringes the Atlantic in the extreme southeast, also have their beaches, made more picturesque by frequent high, rocky cliffs. Generally, the coastal plain, which skirts both the ocean and the bay, is low, ranging from sea level to about 200 feet above. Excepting only these narrow lowlands, the state is generally rough and hilly. To the east of Narragansett Bay, the grassy slopes are low and rounded. To the west, the tree-clad hills are more rugged, but nowhere are there real mountains. Northward and westward from the coastal plain, the land rises abruptly from 200 feet to more than 800 in the northwest. The highest point, in Glocester, is surrounded by a plateau from 600 to 700 feet in elevation, broken by long hills, which are steepest on the south and west.

Rivers and Lakes. Since earliest days, the waterways of Rhode Island have played an important part in its development. For 150 years, the shipping trade concentrated the people on the shores of Narragansett Bay. Later, industrial plants and mill towns were established at the falls of its tributary rivers. The Providence, Seekonk, and other so-called rivers are in reality arms of the bay; the Sakonnet River, which separates the island of Rhode from the mainland on the east, is actually

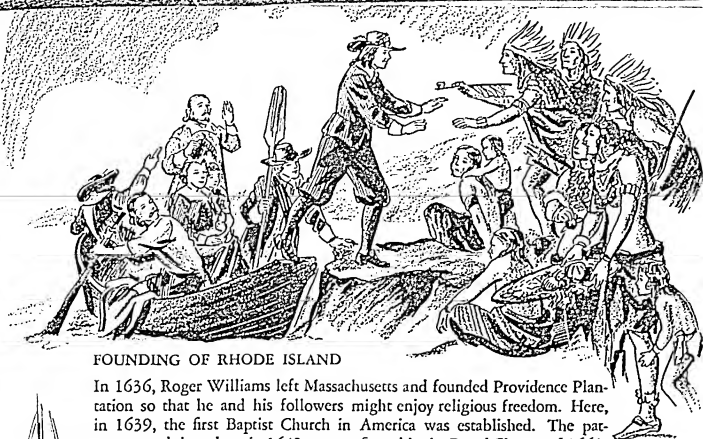
another bay; and the Pettaquamscutt River, paralleling the southwestern shore of Narragansett Bay, is a long lagoon. Since most of these bodies of water are navigable by ocean vessels, they are useful for transportation. They also provide a source of income for the commercial fisherman, and add to the recreational attractions of the state.

Inland, the rivers are generally small but swift, and many break into waterfalls as they rush over the fall line (which see) between the plateau and the lower coastal plain. In addition to these natural cascades, several of the rivers contain man-made dams, which once provided power for turning the wheels of industry. Consequently, their banks are lined with long-established mill towns and manufacturing cities, and their valleys are densely populated. In early days of the nineteenth century, the Blackstone, which rises in Massachusetts and flows southeast into the Seekonk River, was one of the most extensively used rivers in the world, furnishing power for the mills of Woonsocket, Central Falls, and Pawtucket. Providence, the first settlement in Rhode Island and the present capital, owes much of its success to its location at the point where the Moshassuck and Woonasquatucket join to form the Providence River at the head of Narragansett Bay, that broad highway to the ocean. Farther south, the Pawtuxet River breaks into a number of falls, which early attracted many factories; the Saugatucket, which rises in South Kingstown and is only about six miles long, once kept the mills of Peace Dale and Wakefield running. The Pawcatuck, forming part of the boundary between Rhode Island and Connecticut, and emptying into Little Narragansett Bay at the extreme southwest corner, is the largest river of the western section.

As the result of glacial action, Rhode Island is dotted with numerous small lakes and ponds, many of which are popular summer resorts. Largest of these inland bodies of water is artificially enlarged Scituate Reservoir, in the north-central part, the chief source of water supply for Providence. Many of the salt-water lagoons

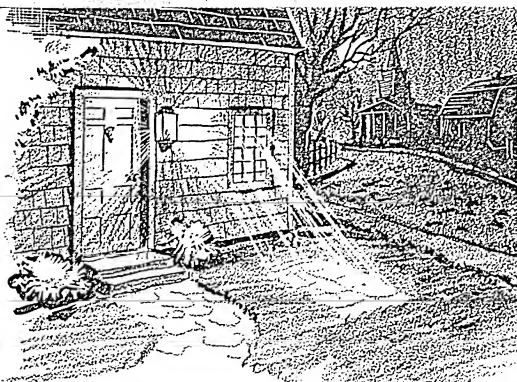
Pronunciation Guide

Algonquian	Pawtucket <i>paw tuk' et</i>
<i>al gahn' kwih an</i>	Pequot <i>pe kwot</i>
Aquidneck <i>ah kwid' nek</i>	Pettaquamscutt
Conanicut <i>kon an' i kut</i>	<i>pet tah kwahms' kut</i>
Glocester <i>glos' ter</i>	Quonset <i>kwon' set</i>
Greenwich <i>green' ilch</i>	Sakonnet <i>sak on' et</i>
Matunuck <i>mah too' nuk</i>	Saugatucket
Miantonomo	<i>saw gah tuk' et</i>
<i>mih ahn' toe noe moe</i>	Scituate <i>sit' yoo ate</i>
Moshassuck <i>moe shahs' uk</i>	Seekonk <i>se' kongk</i>
Narragansett	Wampanoag
<i>nar ah gahn' set</i>	<i>wahn pah no' ag</i>
Niantic <i>nie ahn' tik</i>	Watchaug <i>watch' og</i>
Nipmuc <i>nip' muk</i>	Woonasquatucket
Pascoag <i>pas ko' ag</i>	<i>won as kwa tuk' et</i>
Pawcatuck <i>paw kah' tuk</i>	Woonsocket <i>woon sok' et</i>



FOUNDING OF RHODE ISLAND

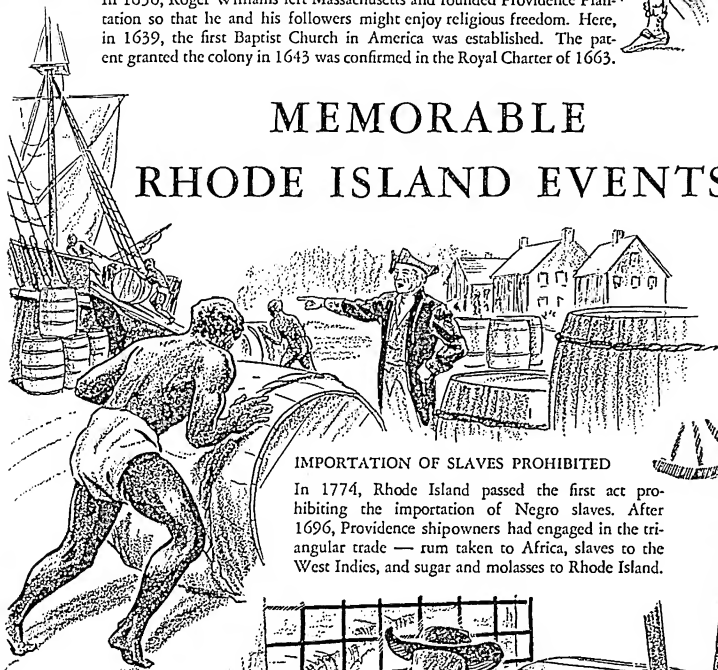
In 1636, Roger Williams left Massachusetts and founded Providence Plantation so that he and his followers might enjoy religious freedom. Here, in 1639, the first Baptist Church in America was established. The patent granted the colony in 1643 was confirmed in the Royal Charter of 1663.



GAS LIGHTING INTRODUCED

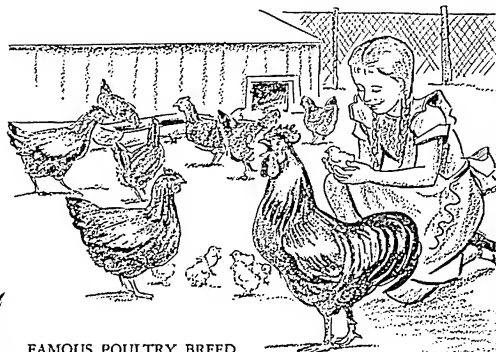
In 1806, David Melville of Newport lighted his house and the street on which he lived by means of a gas made from coal, the first use of this type of light in America. He was granted a patent in 1813, but gas lighting did not replace whale-oil lamps in Providence until 1848.

MEMORABLE RHODE ISLAND EVENTS



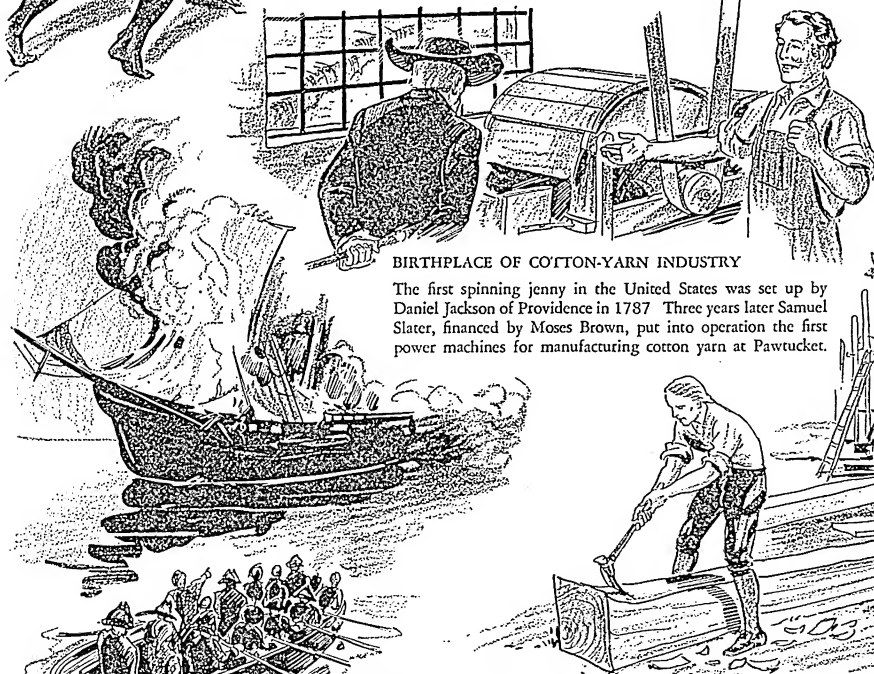
IMPORTATION OF SLAVES PROHIBITED

In 1774, Rhode Island passed the first act prohibiting the importation of Negro slaves. After 1696, Providence shipowners had engaged in the triangular trade — rum taken to Africa, slaves to the West Indies, and sugar and molasses to Rhode Island.



FAMOUS POULTRY BREED

Cross-breeding experiments begun at Little Compton in 1854 by William Tripp and John Macomber gave the world the famous chicken, the Rhode Island Red, so named by Isaac Wilbur.



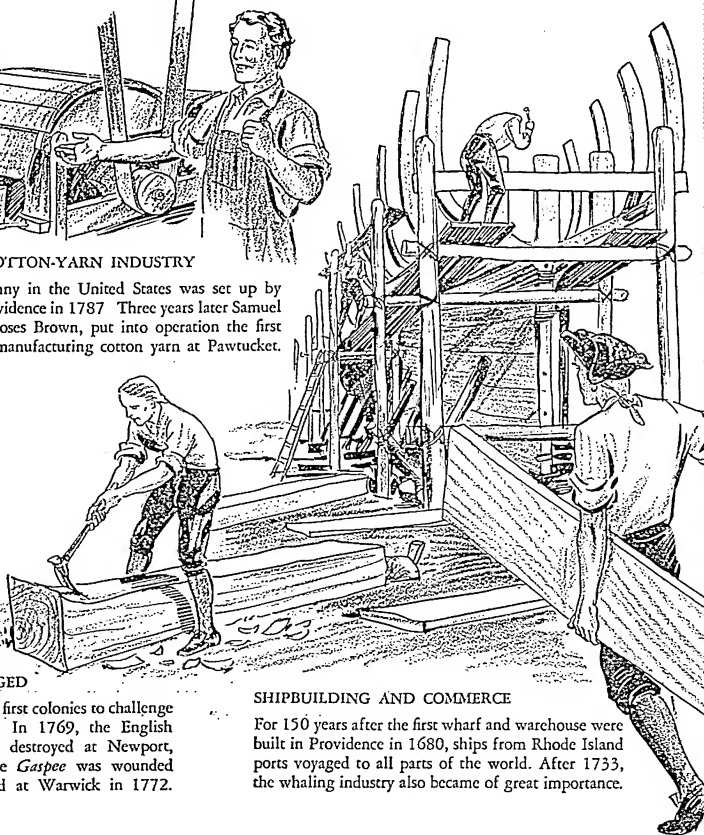
BIRTHPLACE OF COTTON-YARN INDUSTRY

The first spinning jenny in the United States was set up by Daniel Jackson of Providence in 1787. Three years later Samuel Slater, financed by Moses Brown, put into operation the first power machines for manufacturing cotton yarn at Pawtucket.



ENGLAND IS CHALLENGED

Rhode Island was one of the first colonies to challenge the authority of England. In 1769, the English revenue sloop *Liberty* was destroyed at Newport, and the commander of the *Gaspee* was wounded when that ship was burned at Warwick in 1772.



SHIPBUILDING AND COMMERCE

For 150 years after the first wharf and warehouse were built in Providence in 1680, ships from Rhode Island ports voyaged to all parts of the world. After 1733, the whaling industry also became of great importance.

and marshes paralleling the Atlantic coast are also important recreation centers, providing facilities for swimming, boating, fishing, and hiking among the sand dunes which border their shores.

Climate. The moderating influence of Narragansett Bay makes the climate of Rhode Island milder than that of the other New England States. It has fewer extremes of heat and cold, and the delightful summers along the coast have helped to make this section a favorite resort center. Rainfall varies little, averaging about forty inches annually in the north and nearly fifty on the coast.

Natural Resources. More than one hundred species of large native trees and a great number of native flowering shrubs grow in the state. More than one half of its land is forested. Chief among the trees are the oak, maple, ash, hickory, elm, birch, willow, poplar, tulip tree, cedar, and pine. Small animals which haunt the woods or streams include the rabbit, squirrel, fox, raccoon, muskrat, mink, and otter; deer are found in the less populated areas. Many shore birds feed along the coast; among the game birds are the pheasant, quail, partridge, ruffed grouse, woodcock, wild duck, wild goose, snipe, rail, gallinule, and coot.

Rhode Island conserves its natural resources largely through its Department of Agriculture and Conservation. Plants and wild animals are protected in the state forests, parks, and reservations, and by various laws. Since 1734, when Rhode Island became the first state to set aside part of its public domain for the improvement of its oyster beds, many steps have been taken to protect its shellfish. Today, it maintains a lobster hatchery at Wickford, the only one in the United States; a state trout hatchery is at La Fayette. In 1936 the state planning board recommended more than thirty projects to improve harbors, enlarge reservoirs for increasing local water-supply systems, keep the streams from becoming polluted with industrial and sewage waste, prevent floods in the river valleys, and conserve various natural resources.

The People and Their Work

Population: 713,346 (1940), ranking thirty-sixth among the states. **Density,** 674.2 persons per square mile, ranking first. **Distribution,** urban, 91.6 per cent; rural, 8.4 per cent. **Largest cities and towns,** Providence (253,504), Pawtucket (75,797), Woonsocket (49,303), Cranston (47,085), East Providence (32,165), Newport (30,532), Warwick (28,757). For population of other cities, see back of colored map under MASSACHUSETTS. **Chief ports,** Bristol, Newport, Providence.

Chief Products: *Manufactured,* textiles (including wools and worsteds, cotton, silk, rayon, and lace goods), machinery, jewelry, rubber goods, machine tools, silverware, optical and electrical supplies, paper and paper products, power yachts and sailboats. *Agricultural,* dairy products, poultry and eggs, hay, potatoes, corn, oats, vegetables, fruits, flowers. *Mineral,* granite, limestone. *Fishery,* lobsters, crabs, oysters, clams, scallops, mussels, fish.

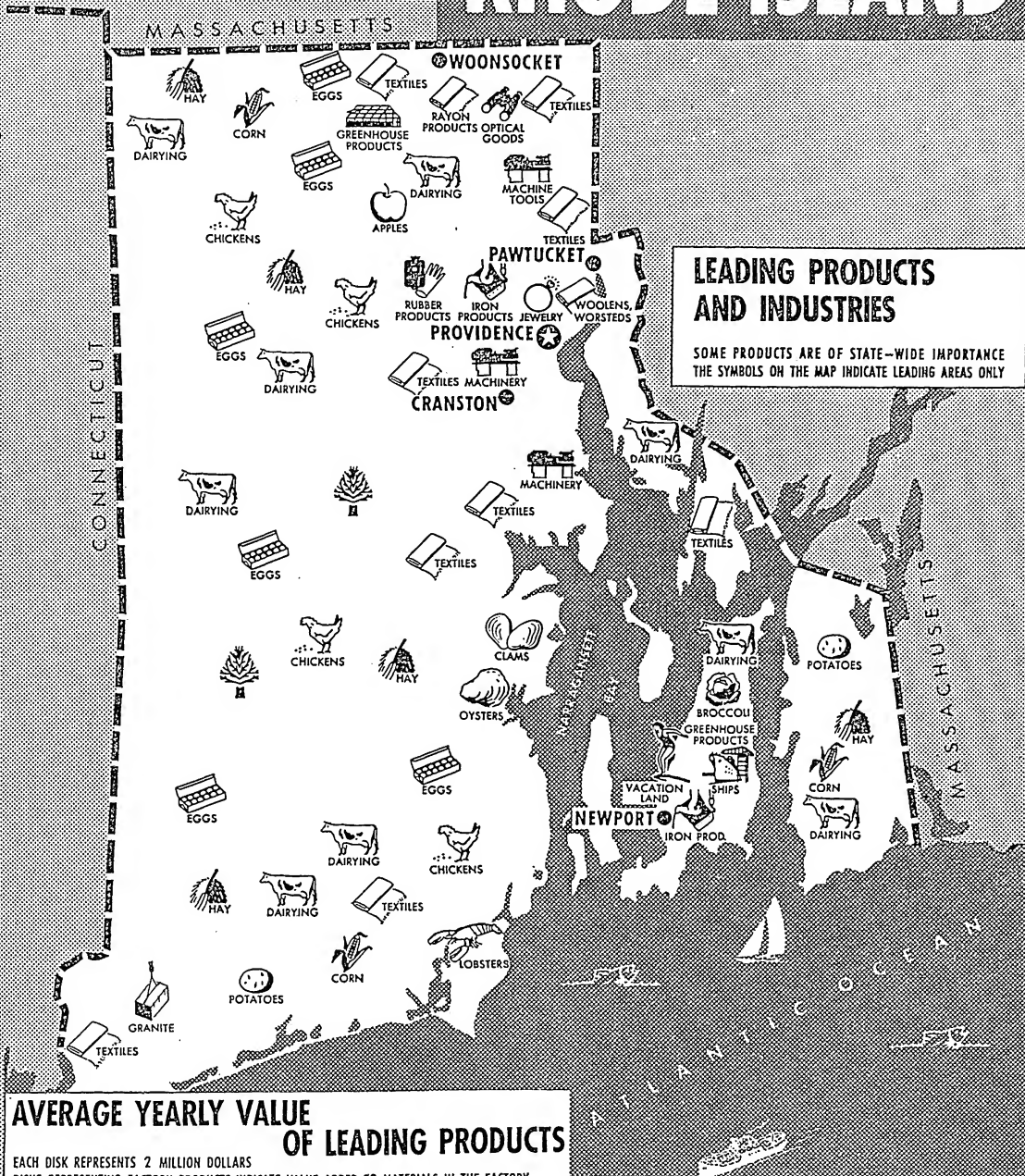
The People. The first settlers were Englishmen from neighboring Massachusetts Bay and

Plymouth, outcasts in the opinion of these colonies, but in their own eyes, refugees seeking religious freedom. Like all the other early colonists, they first became farmers, but, with the sea at their doors, many later turned to shipping, and their vessels were soon trading in the ports of the world. Later, especially between the latter part of the nineteenth century and 1915, the industrial development of the state attracted so many immigrants that three fourths of the population is foreign-born or of foreign-born parents. Of these, English-speaking peoples, including large numbers from Ireland and Scotland, form the oldest and largest group. In 1850, when they made up more than 95 per cent of the immigrant population, most of them worked in the mills and factories. Today, they are generally engaged in industry, business, politics, and law. The Italians, most of whom came as unskilled laborers, now make up more than one fifth of the total foreign-born group, and the Italian "colony" in Providence alone numbers more than 50,000. With the French-Canadians, thousands of whom came to work in the textile mills between 1860 and 1895, the Italians remain most numerous among the present-day industrial workers. In Woonsocket, where many of the French-Canadians settled, a mixture of French and English is commonly spoken. Among other foreign-born groups are numerous English-Canadians, also Portuguese (many of whom follow their traditional occupations of truck farming and fishing), Poles, Russians, Swedes, and Germans. Negroes make up about 1.5 per cent of the population. In 1940 there were only 196 Indians where 30,000 are said to have lived before the coming of the white man.

Manufactures. The first cotton spinning jenny in America, set up at Providence in 1787, was operated by hand. Three years later, the first water-power machines for spinning cotton yarn were built at Pawtucket. Before that time, the secret of power spinning had been carefully guarded in England. In 1789 however, Samuel Slater (1768-1836), having worked with the machines of his native land, came to America disguised as a farmer. Hired by the far-sighted Moses Brown of Providence, he reconstructed the machines from memory, and thus started textile manufacturing in the state. From this early beginning, an abundance of water power, near-by markets (such as those of Boston and New York City), and excellent transportation facilities caused the industry to develop rapidly. Other important factors encouraging the growth of all manufacturing were the invention of a steam engine by George H. Corliss at Providence in 1848, and the use of electricity, which began about 1882.

Today, more than one half of the employed persons of the state are engaged in industrial pursuits, and nearly 1,500 large establishments

RHODE ISLAND



LEADING PRODUCTS AND INDUSTRIES

SOME PRODUCTS ARE OF STATE-WIDE IMPORTANCE
THE SYMBOLS ON THE MAP INDICATE LEADING AREAS ONLY

AVERAGE YEARLY VALUE OF LEADING PRODUCTS

EACH DISK REPRESENTS 2 MILLION DOLLARS

DISKS REPRESENTING FACTORY PRODUCTS INDICATE VALUE ADDED TO MATERIALS IN THE FACTORY



DAIRY PRODUCTS

EGGS

HAY

FISH

POTATOES



STONE (GRANITE)

WOOLENS AND WORSTEDS

MISC. TEXTILES

MISC. MACHINERY

COTTON GOODS

DYEING AND FINISHING

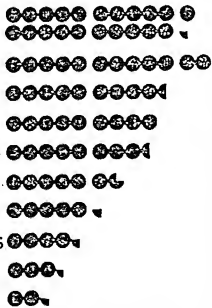
JEWELRY

RAYON GOODS

MISC. RUBBER PRODUCTS

TEXTILE MACHINERY

NEWSPAPERS



LAND USE



CROPS 9% PASTURE 9% FORESTS 54% OTHER 28%

Based on latest U.S. Government statistics; prepared for the exclusive use of the
WORLD BOOK ENCYCLOPEDIA by Pictograph Corporation

annually convert raw materials into products valued at more than \$500,000,000. The leading industry continues to be the manufacture of woolen and worsted goods. Although various types of textile mills are found in Providence, Pawtucket, Central Falls, and elsewhere, Woonsocket is the chief center of woolen and worsted

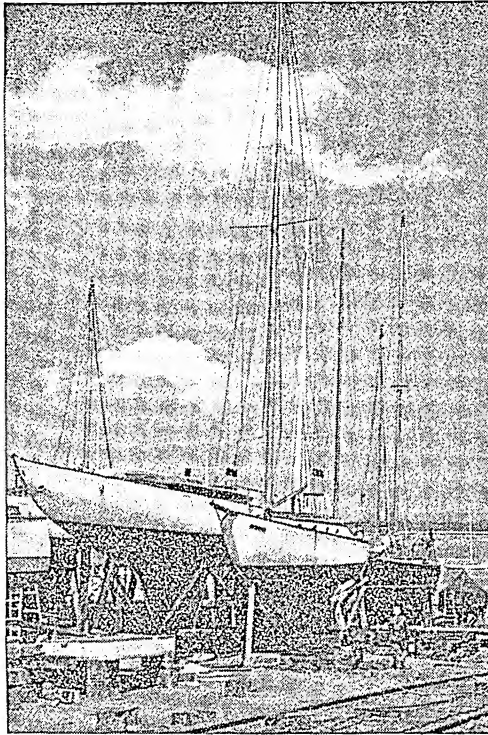


Photo: Hirsch

YACHT BUILDING AT BRISTOL

production. In the manufacture of cotton goods, Rhode Island continues to be a leader, although competition from southern mills has become more and more serious since 1910. However, the manufacture of rayons (important after 1929), laces, and knitted goods, has forged ahead. Since 1790, when East Greenwich printed the first calico in the United States, the finishing and dyeing of textiles has been a leading industry. The manufacture of textile machinery is important, and large quantities of other types of machinery, nuts and bolts, machine tools, and precision instruments are made.

In colonial times, Rhode Island silversmiths converted their customers' excess coins into rings and buckles. Later, in 1794, Nehemiah Dodge of Providence discovered a method of washing a baser metal with a more precious one, and with his brother, Seril, founded the American jewelry industry. Today, Providence, still the center of production, is known

around the world as a leading manufacturer of costume and precious jewelry, jewelers' findings, and instrument cases. There are also many silverware plants in the state, including the world-famous factory founded at Providence in 1831 by Jabez Gorham, who started his career by making silver spoons and selling them from door to door. Other leading industries include the manufacture of rubber goods, paper products, bricks, glass bulbs, electrical and optical supplies, paints, and radio tubes; the publishing of newspapers and periodicals; and the building of yachts and small boats. The last of these is a reminder of early colonial days, when Newport, Providence, and other coastal cities were famous for their busy shipyards. In 1876 the *Lightning*, the first torpedo boat ever built, was made at Bristol; many famous yachts have also been constructed there.

Agriculture. A necessary pursuit of all the early settlers, agriculture now engages less than 2 per cent of the people, and many former farms have long since become factory sites, or have been added to the suburbs of the industrial cities. The soil, containing much boulder clay and stony drift, is generally poor. However, in the Narragansett basin, especially on the island of Rhode Island, and in the northwest, it is fertile, producing hay and forage, corn, and oats on a small scale. Potatoes are a leading crop, and truck gardening flourishes, especially in Providence, Kent, and Newport counties, where the cities provide ready markets. The Rhode Island greening (apple), once a specialty of the state, was developed from a Far Eastern fruit. Fruits now raised include peaches, pears, strawberries, raspberries, and melons. The success with which grapes are grown indicates that there may be some basis for the old belief that this region is the "Vine-land" of the Vikings. Nurseries, scattered over the state and especially important on the island of Rhode Island, grow many flowers, shrubs, and ornamental trees.

Dairying and Livestock. In early days, sheep raising was a leading industry, and an unusual breed of saddle horse, called the Narragansett pacer, was developed and raised for export to Virginia and the West Indies. During the latter part of the nineteenth century, however, poultry raising became more important, and the Rhode Island Red, developed at Little Compton, was recognized as a new breed of chickens in 1895. Today, chickens, turkeys, ducks, and eggs are very profitable sources of farm income. Dairying, however, is the most important branch of agriculture, more than one third of the farm land being devoted to the grazing of herds of milk cows. Hogs, horses, and sheep are raised on a small scale.

Minerals. Westerly granite, excellent for monuments and building purposes, is the most

valuable mineral product. It is quarried chiefly near the city for which it is named, and in other parts of the southwest. Limestone, clay, sand, and gravel are also commercially valuable. Although coal is found in the Narragansett Bay region, attempts to mine it at Cranston, Portsmouth, and Valley Falls have been abandoned, for it is slow to ignite, tends to form clinkers, and consequently has a low fuel value. In fact, the coal of Rhode Island, more than any other in the world, has largely changed to graphite. Other minerals occurring in limited quantities include graphite, greenstone, sandstone, soapstone, quartzite, and iron ore.

Fisheries. During the last quarter of the eighteenth century and the first half of the nineteenth, Newport, Providence, and Warren were important whaling centers. Whale oil and spermaceti candles (made from the head oil of the sperm whale) were profitable articles of trade, shipped to many far-distant markets. Even before that time, coastal fishing had become part of the seafaring tradition of Rhode Island. Today, the lobster is the most valuable shellfish caught, but excellent oysters, scallops, mussels, clams, and crabs are also taken. In the waters off Block Island, swordfish, tuna, sea bass, bluefish, and other deep-sea fish are caught. Narragansett Bay and its arms yield large catches of mackerel, eel, flounder, scup, menhaden, and striped bass.

Transportation. Since colonial days, shipping has been a leading industry, for all the early settlements were on or near Narragansett Bay. Rhode Island was also prominent in the so-called triangular trade of the eighteenth century. (See COLONIAL LIFE IN AMERICA, [Industry and Trade].) Steamship lines usually ply between the capital and Newport, Block Island, New York, Baltimore, and Norfolk, and an extensive coastwise trade is carried on. A network of ferry lines long connected the mainland and the various islands, but several of these have been replaced by bridges such as the Jamestown, connecting Saunderstown and Conanicut Island. When completed in 1940, this was the longest cantilever bridge in New England, measuring 6,982 feet in length. Another important span is the Mount Hope bridge, crossing the mouth of the bay of the same name between Bristol and Portsmouth. In 1929, when it was opened to traffic, it was the longest (6,130 feet) and highest suspension bridge in New England. The Blackstone Canal, which linked Providence and Woonsocket with Worcester, Mass., operated from 1828 until 1844.

The state has more than 2,700 miles of roads, about one half of which are improved. The first railroad in Rhode Island, connecting Providence with Boston, began to run trains in 1835; today, more than 260 miles of main track are in use. (For a list of the railroads, see MASSACHUSETTS [colored map].) There are

several airports and seaplane anchorages and bases in the state. The Hillsgrove airport in Warwick, opened in 1931, was the first state-owned airport in the United States.

Press and Radio. *The Rhode Island Gazette*, the first newspaper in the colony, was published at Newport in 1732 by Benjamin Franklin's brother James. Twenty-six years later, his son (also named James) established the *Newport Mercury*, which still appears weekly. After the founder's death, in 1762, this pioneer publication was edited by his mother, Ann Franklin, who is said to have been the first woman newspaper editor in America. Today, about twenty-five newspapers and more than a dozen periodicals are published.

The oldest radio broadcasting stations are WEAN and WJAR of Providence, both of which first went on the air in 1922. Two other leading stations are WPRO of Providence (1931) and WFCI of Pawtucket (1941).

Social and Cultural Achievements

Educational Institutions: *State Teachers' College*, Rhode Island College of Education at Providence, established in 1834 as the Rhode Island Normal School. *Other Colleges and Universities.* Brown University (which see); Bryant (commercial), Providence (Roman Catholic), and Rhode Island State (coeducational, state-controlled, land-grant, and technological, especially agricultural) colleges; Rhode Island College of Pharmacy and Allied Sciences; Rhode Island School of Design (which see).

State Welfare Institutions: *Children,* Sockanosset School (boys) and Oaklawn School (girls) at Howard (both correctional); *State Home and School*, Providence (dependent or neglected children). *Physically handicapped*, an infirmary at Howard (indigent ill); a tuberculosis sanatorium at Wallum Lake; a school for the deaf at Providence. *Mentally handicapped*, school for the feeble-minded, Exeter; hospital, Howard. *Soldiers' Home*, Bristol. *Penal institutions*, prison and men's and women's reformatories at Howard.

Education. In early days, boys were usually taught by the local minister; girls in the so-called dame schools. From 1760 until about 1830, numerous public schools were opened. One of the most noted (private) boys' preparatory schools in the United States is the Moses Brown School, founded as a Quaker institution (Friends' School) at Portsmouth in 1784, and reopened in Providence in 1819. A girls' division, known as Lincoln School, was established in 1834. In 1800 the first state-wide public-school law was passed, but it was repealed three years later, then replaced in 1828, when the first permanent school fund was provided. It was not until 1845, however, that the basis for the present system was laid. This was done under the guidance of Henry Barnard, the famous Connecticut educator, whose work was so outstanding that Horace Mann, declared that Rhode Island had "one of the best systems of public instruction in the world." See BARNARD, HENRY; MANN, HORACE.

The head of the present highly developed system is a director of education, appointed by the governor with consent of the senate for two years. Children between the ages of seven and sixteen are compelled to attend school. An

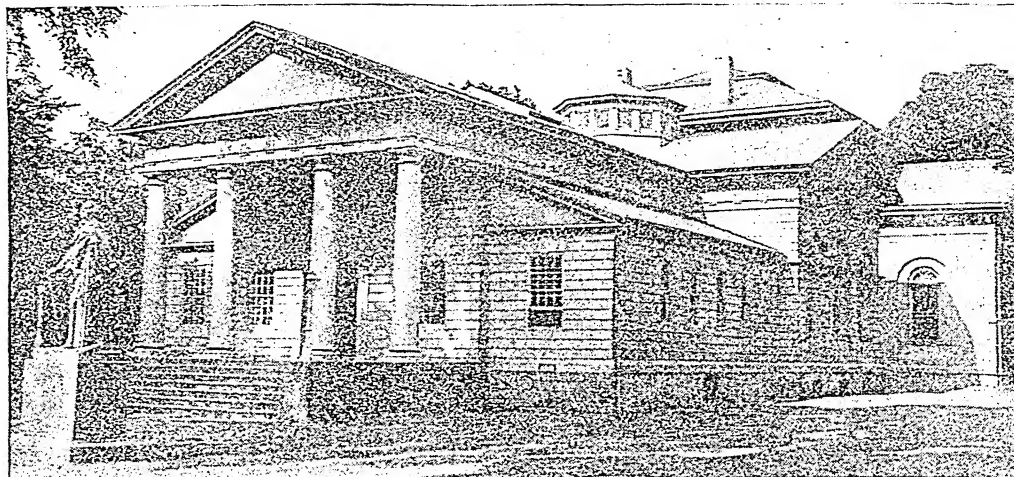


Photo: Ewing Galloway

REDWOOD LIBRARY IN NEWPORT, BUILT IN 1747, A RHODE ISLAND LANDMARK

Americanization law (passed in 1919) requires all persons between sixteen and twenty-one who cannot read, write, and speak English to attend public night schools. Towns having no secondary schools are required to provide educational privileges for their young people in centers where high schools are maintained. This service is rendered at no expense to the parents, even for transportation. Education for the deaf is compulsory, and a state school is maintained at Providence. The blind are educated outside the state at state expense.

Religion. Rhode Island was founded by men and women determined to achieve the ideal of religious freedom, and the colony soon became a haven for those of many faiths. Among these were Baptists, who founded the first Baptist Church in America at Providence in 1639; Quakers, who came to Rhode Island as early as 1657; and Jews, the first of whom arrived in Newport from Holland in the following year. It was also at Newport that the Seventh-Day Baptist Church was organized in 1671. One of the first Sunday schools in America was started in one of Samuel Slater's spinning mills in 1796 to provide instruction for youthful workers. Since the coming of the Italians, Irish, French-Canadians, Poles, and Portuguese in the mid-nineteenth century, Roman Catholics have made up the largest religious group, accounting for more than one half of the total church membership. Other leading denominations include the Episcopal, Jewish, Baptist, Congregational, Methodist, and Lutheran.

Libraries. The first public library in Rhode Island was established at Newport in 1700 through the efforts of Thomas Bray, an English minister. Today, practically every person in the state has access to free library service, and more than seventy public library systems re-

ceive state aid. The state library sends traveling libraries into the rural districts, and delivers books, supplied by the American Merchant Marine Association, to seamen ashore and to men on duty at coast-guard stations and army and navy posts. The John Hay Library of Brown University contains nearly 600,000 volumes, including one of the most complete Lincoln collections in the world, the noted Harris collection of American poetry and plays, the Rider collection of Rhode Island history, and the valuable Hoffman collection of books pertaining to Napoleon. The John Carter Brown Library, also of Brown University, contains the largest collection of North, Central, and South American history and literature prior to 1801, consisting of about 30,000 volumes. The libraries of the Rhode Island (at Providence) and Newport historical societies are also outstanding. The oldest library in the state is the Redwood Library and Athenaeum at Newport (established in 1747), with more than 87,000 volumes. Another pioneer private library is the famous Providence Athenaeum (established in 1831), with more than 120,000 volumes.

Arts and Crafts. Rhode Island is famous for its well-preserved colonial houses, churches, and other buildings. Many of the picturesque old homes, especially those in Newport and Providence, were built by the wealthy shipping magnates of early days. The estates bordering the Ocean Drive at Newport are also famous for their handsome nineteenth-century houses and landscape gardening. Current architecture generally follows styles developed in the eighteenth and nineteenth centuries, giving the cities and towns a colonial New England flavor. Other reminders of early days are the many fine examples of colonial silverware, furniture,

and various artwares still found in the state. Among the pioneer silversmiths of Rhode Island were Joshua Doane, Saunders Pitman, Arnold Collins, Samuel Vernon, Jonathan Otis, and Samuel Casey; later, in the nineteenth century, Jabez Gorham won distinction in this field. Most noted of the cabinet makers were John Goddard and Job and John Townsend, all of Newport. Chief among the many outstanding Rhode Island painters was Gilbert Stuart, whose portraits of Washington are world-famous. His birthplace at North Kingstown, adjoining the old water-power snuff mill of his father, is now a museum. The mill still runs and grinds snuff. Edward G. Malbone (1777-1807), who was born at Newport, was also a distinguished painter, noted for his miniatures.

Many outstanding musicians have been born, or have lived, in the state. Among these was David Wallis Reeves, who directed the American Brass Band of Providence from 1866 to 1900, and was called the "father of band music in America" by John Philip Sousa (which see). The first dramatic performance in New England was given at Newport in 1761. Today, the best-known of the little-theater groups is the Players of Providence, an outgrowth of the Talma Club, founded in 1887. During the summer, theatrical performances are given at Matunuck and in the Casino Theater at Newport. The most outstanding literary works of colonial times were those of Roger Williams, whose *The Key into the Language of America*, published in England in 1643, is still used as a source book of Indian terms. Henry Wadsworth Longfellow's poem, "The Skeleton in Armor," was inspired by the Old Stone Mill at Newport, which some scholars believe to be a relic of the Norsemen; others think it is the ruins of an old windmill built in 1676 by Benedict Arnold, first colonial governor under the charter of 1663.

Social Welfare. Among the first welfare measures were the establishment of an almshouse at Newport in 1723, and the setting aside of state funds for the relief of poor sailors in 1730. In 1774 Rhode Island became the first colony to pass an act prohibiting the importation of slaves. As early as 1852, capital punishment was abolished. In 1915 a juvenile-court act was passed. The Children's Friends Society, formed in 1836 as a result of the crusading efforts of Seth Luther, was one of the earliest efforts to provide for the education and welfare of children, especially of those engaged as mill hands. Today, progressive social legislation includes a workmen's compensation act, and provisions for old-age assistance, unemployment insurance, industrial inspection, aid to dependent children, and minimum wages and maximum hours for women and minors. In 1936 the minimum working age (with certain exceptions) was raised from fourteen to sixteen

years; a Department of Labor was established in 1919. A labor-relations board, set up in 1941, represents the public, labor, and employers. A Bureau of Aid to Dependent Children is also maintained. Public clinics and nurses are provided; sanitation measures are enforced, and an immunization program is carried on.

Recreation and Out-of-Doors

Rhode Island is noted for its fine beaches, which afford safe bathing to residents and summer visitors. Oldest of the resorts is Newport, where wealthy southerners spent their summers long before the Revolution. Others include Block Island, Narragansett Pier, and Watch Hill. Narragansett Bay, with its landlocked water and steady breezes, is a paradise for both sailors and power yachtsmen. Deep-sea fishing is made easy by the proximity to the sea, and well-stocked streams and ponds attract thousands of fresh-water fishermen each year. The hunting of wild fowl and small game is also popular.

In the field of sports, Rhode Island holds many "firsts." The first public skating rink in the United States was opened at Newport in 1866, and the first world championship baseball game was played at Providence in 1884. The first stroke-play national golf championship in America was held at Newport in 1894; the first open golf championship, in 1895. Newport also saw the first national championship tennis matches in 1881, and the first international polo contests in 1886.

State Parks, Forests, and Reservations. Nearly 4 per cent of the total land area has been set aside for public recreational purposes. Among the state parks, reservations, and forests, which number more than forty and cover nearly 8,000 acres, are:

Beach Pond Reservation (840.4 acres), near Nooseneck Hill. Hilly, wooded area, with a 400-acre lake, as well as camping and picnicking facilities. Surrounding it is a large Federal-owned area used for forest-conservation purposes and as a recreational center. Created, 1936.

Burlingame Reservation (3,100 acres), near Charlestown. Wild life sanctuary and scenic recreational center, skirting Watchaug Pond; includes a large pine-forested area. Created, 1927. Nearby is the Kimball Bird Sanctuary, a beautifully landscaped wild-life preserve.

George Washington Memorial Forest (244 acres), near Glocester. Wooded game preserve and recreational center, with hiking trails. Created, 1932.

Goddard Memorial Park (472 acres), near East Greenwich. Forested recreational area, containing a reconstructed Narragansett Indian Village. Created, 1927.

Lincoln Woods Reservation (604.5 acres), near Lincoln. Rock-strewn, wooded area, surrounding Olney Pond; recreational facilities. Contains two old colonial houses and several historic sites, including Pulpit Rock, from which King Philip is said to have rallied his warriors during the New England Indian war. Created, 1908.

Scarborough Beach Reservation (about 24 acres),

near Narragansett. Fine beach, with facilities for surf bathing. Created, 1935.

Wickaboxet Forest (288 acres), near West Greenwich. Forest preserve and game sanctuary, with recreational facilities. Created, 1932.

Other Places to Visit, which attract many visitors annually, include:

Anmary Brown Memorial, Providence. Noted for its collection of early books published before 1500 and other objects of art.

Beaver Tail Point, Conanicut Island. From the sixty-foot-high cliffs, the visitor gets a fine view of the Atlantic Ocean, Newport, and the Narragansett shore. Site of the first Rhode Island lighthouse, built in 1749. Reached by the Jamestown bridge or the Newport ferry.

Easton's Beach, Newport. White sandy beach, about 2,500 feet long, providing excellent surf bathing. About four miles away is Bailey's Beach, an exclusive recreational club which became world-famous many years ago.

Cliff Walk, Newport. Unusually beautiful three-mile walk, with the rocky coast of the Atlantic Ocean on one side and some of the most beautiful estates in America on the other.

Colonial Churches: *First Baptist Meeting House*, Providence. One of the most interesting buildings in New England from an architectural and historical point of view; designed by Joseph Brown, an unusually able amateur architect, aided by T. Sumner; built in 1774-1775; long used for the commencement exercises of Brown University. *Temple Jeshua Israel*, Newport. Oldest synagogue in America, built in 1763. *Trinity Church*, Newport. Typical Episcopal church of colonial times, with box pews and a three-deck pulpit; a replica of the crown of England still surmounts the organ and church spire; has the first church bell ever rung in New England.

Colonial Houses: *Clemence*, Johnston. Interesting example of the seventeenth-century home, with its large stone end chimney; built about 1680. *John Brown*, Providence. Handsome Georgian three-storied brick house with a widow's walk, designed by the owner's brother, Joseph, in 1786; described by Mrs. John Adams, wife of the President, as "one of the grandest I have seen in this country;" now home of the Rhode Island Historical Society. *John Carter Brown*, Providence. One of the largest and finest remaining colonial houses; built in 1792 by Joseph Nightingale. *Joseph Brown*, Providence. Three-storied brick house, topped with a "widow's walk," designed by the owner, and built in 1774. *Nathanael Greene*, near Goddard Park, East Greenwich. Remodelled white frame birthplace of the famous officer who was second only to Washington as a Revolutionary general. *Oliver Hazard Perry*, South Kingstown. Birthplace of the hero of the Battle of Lake Erie in the War of 1812, now a private museum, housing relics of both him and his younger brother, Commander Matthew C. Perry, who opened Japan to the world. *Whitehall*, Middletown. Home of Dean George Berkeley (1685-1753), the famous Irish bishop, philosopher, and author, who lived in Rhode Island between 1729 and 1731 and contributed to its cultural development.

King Philip Museum, on Mount Hope near Bristol. Museum of Indian relics on the old camping ground of King Philip, chief of the Wampanoags.

Old Slater Mill, Pawtucket. Second cotton mill in America, built in 1793; now a museum containing several of the first pieces of machinery built by Samuel Slater in 1790, and other colonial relics.

Purgatory, Middletown. Deep chasm in the cliffs lining the beach; associated with various Indian legends.

Roger Williams Park, Providence. One of the largest and finest in New England. See PROVIDENCE.

Government

National: Electoral votes, 4. Representatives in Congress, 2.

State: Senators, 43; representatives, 100. *Capitals*, Newport, East Greenwich, Bristol, South Kingstown, and Providence (at the same time), 1663-1854; Newport and Providence, 1854-1901; Providence since 1901. Counties: 5.

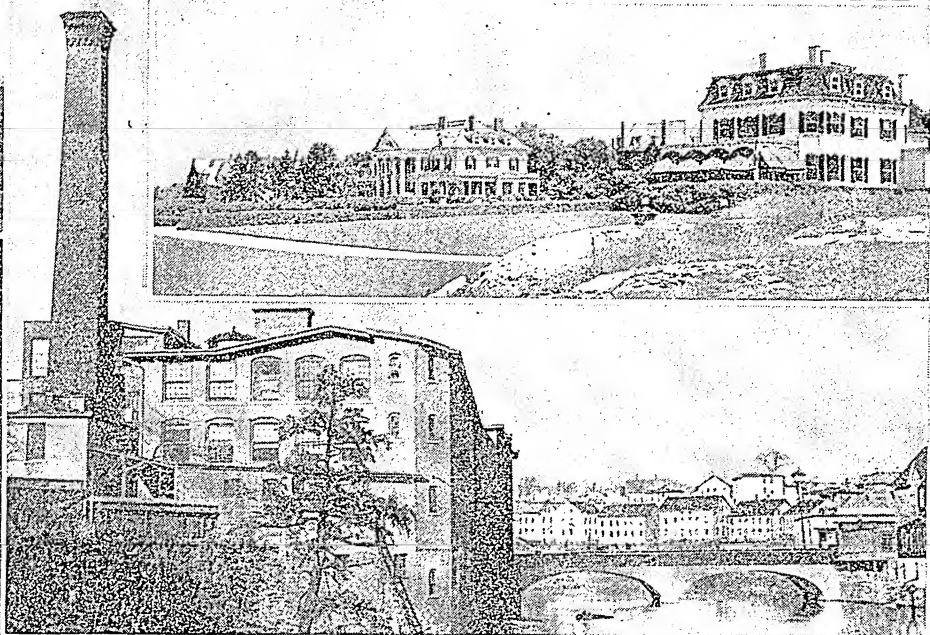
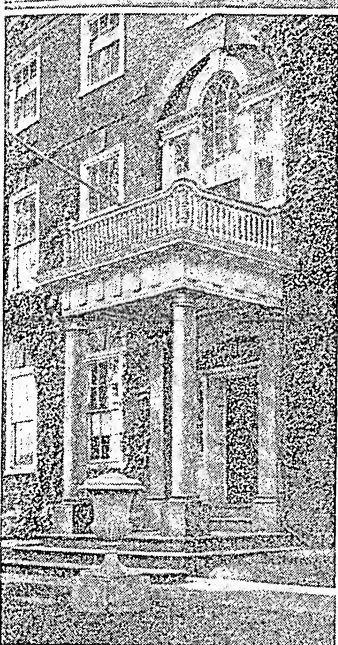
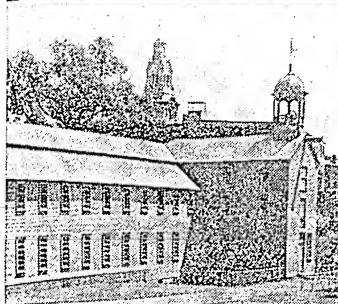
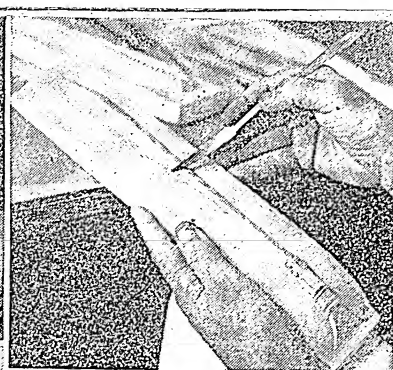
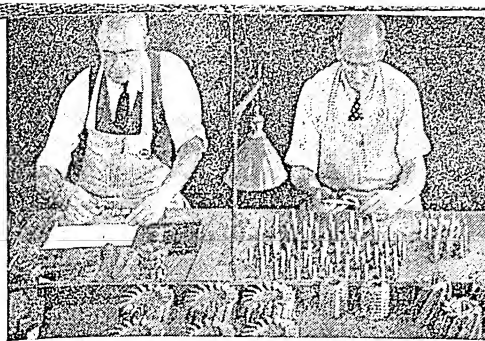
Rhode Island is governed under a constitution adopted in 1842, the result of a movement to broaden the suffrage by reducing the amount of property citizens must have before they could vote. Its former constitution, the original royal charter of 1663, permitted only those with real estate or property valued at about \$500 to vote. The present document has been amended several times. In 1888, property qualifications for voters in state elections were removed. However, only those who paid taxes on \$134 worth of property might vote for members of any city council, or on the levying of taxes and expenditures of public money in any town or city. In 1928 an amendment retained these qualifications in the towns, but removed them in the cities. Amendments to the constitution must be passed by both houses of two successive assemblies, and must be ratified by three fifths of the electors by vote in town meetings.

Executive officers consist of a governor, lieutenant governor, secretary of state, attorney general, and general treasurer, each elected for two years. With the consent of the senate, the governor appoints the directors of each of eleven administrative departments handling such matters as finance, social welfare, public works, business regulation, labor, education, health, and agriculture and conservation. The governor may exercise the right of veto, granted to him in 1909.

Legislative power is vested in a general assembly, consisting of a senate and a house of representatives, the members of both being elected for two years. The senate consists of the lieutenant governor, one senator from each of seven cities and thirty-two towns, and one senator from each district with more than 25,000 qualified voters. Representatives are apportioned according to population, each town or city having at least one, and none having more than twenty-five. The assembly meets annually in January, and a new government is begun in each odd-numbered year.

Judicial decisions are made by a supreme court of five judges, an eleven-member superior court, and various minor courts. Judges of the supreme and superior courts are elected by the general assembly, and hold office until dismissed by that body, or found guilty of a misdemeanor.

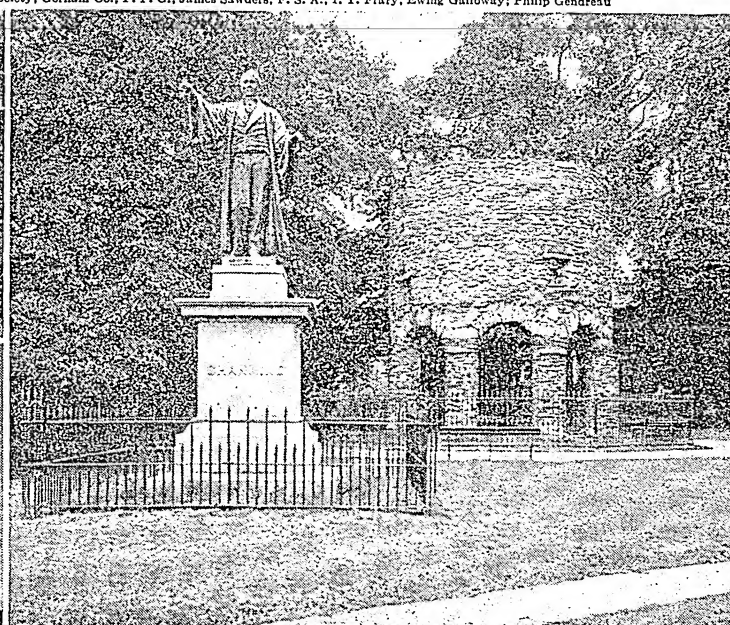
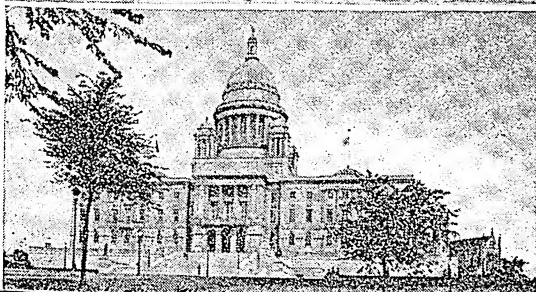
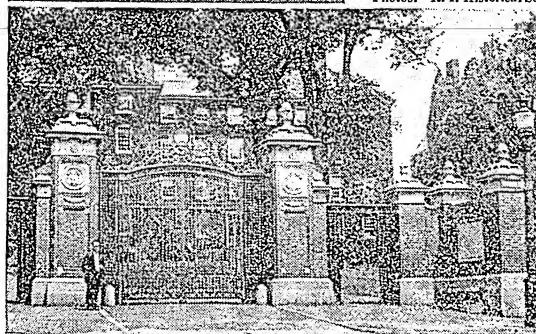
Local Government is centered in the cities and towns, county government having little significance. Towns are governed by town meetings, which originated during colonial days; four cities (Central Falls, Newport, Paw-



RHODE ISLAND—PAST AND PRESENT

Top left: Making precision tools is a leading industry. *Top center:* The silverware industry was started by Jabez Gorham in 1831. *Top right:* Marker at Little Compton, commemorating the "birthplace" of the Rhode Island Red breed of chickens. *Second left:* Slater's Mill at Pawtucket, the oldest textile mill in the United States. *Second right:* Fine homes at Newport. *Above:* An old mill and bridge at Woonsocket. *Third left:* Doorway of the Brown-Perry House, Providence, built about 1786. *Fourth left:* Entrance to Brown University. *Fifth left:* The capitol at Providence. *Below:* Historic Old Stone Mill at Newport, and statue of William Ellery Channing, the nation-famous American preacher.

Photos: R. I. Historical Society; Gorham Co.; F. P. C.; James Sawders; F. S. A.; I. T. Frary; Ewing Galloway; Philip Gendresu



tucket, and Woonsocket), by a mayor and two-chamber council; and three cities (Cranston, Providence, and Warwick), by a mayor and one-chamber council.

National Politics. Between 1856 and 1924, the electoral votes of the state were cast for the Republican candidate in every presidential election except that of 1912. From 1928 through 1940, the state voted for the Democratic candidate. See **POLITICAL PARTIES** (chart).

Famous Rhode Islanders

Numerous famous Rhode Islanders, either by birth or adoption, have separate biographies (see *Biographies* in the list of related subjects at the end of this article). Others who have achieved state, national, or international fame include:

Allen, Zachariah (1795-1882), born at Providence. Lawyer who became famous as a scientist, inventor, and "father" of the mutual type of fire insurance. Among his inventions, many of which aided the industrial development of Rhode Island, were the first hot-air furnace for home use (1821), an automatic cutoff valve for the steam engine, and an improved fire engine.

Brown, John Carter (1797-1874), born at Providence. Wealthy cotton manufacturer; collector of the famous library now bearing his name.

Brown, Joseph Rogers (1810-1876), born at Warren. Inventor of machinery and precision tools which materially changed manufacturing methods; founder of Brown and Sharpe, one of the largest tool-manufacturing companies of the United States.

Brown, Moses (1738-1836), born at Providence. Wealthy merchant and manufacturer who financed Samuel Slater and founded the first cotton-manufacturing company in America; noted Quaker abolitionist and founder of the Rhode Island Abolition Society; founder of the preparatory school now bearing his name.

Brown, Nicholas (1769-1841), born at Providence. Merchant and philanthropist, nephew of Moses Brown and father of John Carter Brown. With his brother-in-law, Thomas Poynton Ives, he operated one of the leading shipping concerns of the state. His large gifts to Rhode Island College caused the trustees to rename it Brown University.

Bull, William Tillinghast (1849-1909), born at Newport. Believed to have been the first American physician to practice surgery exclusively; one of the first to adopt antisepsis and to advocate removal of the appendix.

Corliss, George Henry (1817-1888), born at Easton, New York. World-famous inventor, ranking with James Watt (which see) as the developer of the steam engine.

Doyle, Sarah Elizabeth (1830-1922), born at Providence. Advocate of higher education for women; helped to establish the Rhode Island School of Design and the woman's college (Pembroke) of Brown University.

Dyer, Mary (? -1660), born in England. Quaker martyr who sought refuge in Rhode Island (1657), and was hanged on Boston Common for bearing witness to her faith.

Goddard, John (1723?-1785), born in Dartmouth, Mass. One of the most noted colonial cabinetmakers, famous for his kneehole desks and secretaries; considered the originator of the "block front," a type of front, as of a secretary, with a sunken center panel, on each side of which is a raised panel or block.

Herreshoff, Nathanael Greene (1848-1938), born

at Bristol. Builder of several yachts which were successful defenders of America's Cup, and of numerous high-speed torpedo boats for the United States Navy.

Hopkins, Esek (1718-1802), born at Scituate. First commander in chief of the Continental Navy. See **NAVY** (History of the United States Navy).

Hopkins, Stephen (1707-1785), born at Scituate. Brother of Esek Hopkins. Member of the Colonial Congress of Rhode Island and governor almost continuously from 1755 to 1768; leader in the opposition to British "taxation without representation." Signer of the Declaration of Independence; first chancellor of Brown University. His home at Providence is now a museum.

Tourjee, Eben (1834-1891), born at Warwick. Famous organist and choirmaster of Trinity Church at Newport, who founded the Musical Institute of Providence (1864) and the New England Conservatory of Music (at Boston in 1867).

Wheaton, Henry (1785-1848), born at Providence. Lawyer who won fame as an historian of international law; the first diplomat from the United States to Denmark (1827-1835); minister to Prussia (1837-1846).

State Symbols and Events

State Seal: A small scroll above an anchor bears the state motto, Hope; the anchor was the seal of the colony in 1637; 1636 is the founding date of the colony.

State Flag: See **UNITED STATES OF AMERICA** (color plate, Flags of the States).

State Motto: Hope.

State Bird: Bobwhite (unofficial). See **BIRDS** (color plate, Birds That Help the Farmer).

State Flower: Violet. See **FLOWERS** (color plate, Woodland Flowers).

State Tree: Maple.

State Song: None.

Annual State Events. Among the interesting events on the state calendar are:

Ice Carnival, Providence, in January.

Winter Sports Carnival, Providence, first week in February.

Rhode Island Independence Day, state-wide, May 4. *Opening of the Horse-racing Season at Narragansett Park*, Pawtucket, in April.

Newport-to-Bermuda Race of the Cruising Club of America. Newport, in June (no fixed date).

Providence Festival Chorus Concert, Providence, in June (no fixed date).

Feast of Our Lady of Mount Carmel (Italian), Bristol, July 16.

Casino Tennis Tournament. Newport, third week in August.

Astor and King's Cup Races, Course off Brenton's Reef at Newport, third week in August.

Watch Hill Beach Club Water Carnival, Watch Hill, fourth week in August.

In addition, America's Cup races are sailed off Newport in July of those years in which there is a challenger.

History

1524 Verrazano visited Narragansett Bay.

1636 Roger Williams founded Providence.

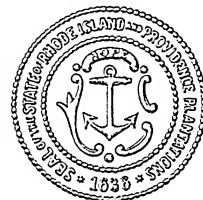
1638 Coddington, Clarke, and others settled on Aquidneck Island.

1639 First Baptist Church in America organized at Providence. Newport founded.

1644 First charter, uniting the scattered early settlements, granted Roger Williams by the English Parliamentary Commission.

1663 Charles II of England granted Rhode Island its second charter.

1764 Rhode Island College (later Brown University) established.



- 1774 Importation of slaves prohibited.
- 1776 Rhode Island formally declared its independence of England, the first colony to do so.
- 1790 Samuel Slater and Moses Brown launched the industrialization of America by creating the American textile industry at Pawtucket.
- 1813 British forces occupied Block Island during the War of 1812.
- 1828 State-wide public schools and a permanent school fund provided. Blackstone Canal opened.
- 1842 "Dorr Rebellion" resulted in the adoption of a more liberal constitution.
- 1845 Basis of present educational system laid as a result of a survey by Henry Barnard.
- 1936 Rhode Island celebrated the three-hundredth anniversary of its founding.
- 1938 Disastrous hurricane and tidal wave.
- 1941 Large United States naval air base established at Quonset Point.

Indian Days. The region now known as Rhode Island was first occupied by the Narragansetts, Niantics, Nipmucks, Pequots, and Wampanoags. All were members of the Algonquin family of Indians, the largest group of tribes in North America. A peaceful people, they obtained their food by hunting and fishing, and by raising corn, beans, and squash.

Exploration and Settlement. Probably the first white man to see what is now Rhode Island was Miguel Cortereal, the Portuguese navigator, who is thought to have sailed along the coast in 1511. Thirteen years later, Giovanni da Verrazano, an Italian in the employ of France, visited Narragansett Bay. In 1614 the Dutch captain, Adriaen Block, anchored at the island which now bears his name. Later, others came to engage in fur trading.

Roger Williams is considered the father of Rhode Island. Exiled from Massachusetts, Williams founded Providence in 1636 on land purchased from Canonicus and Miantonomo, two Narragansett chiefs. His avowed purpose was to develop a community where he and his followers might enjoy religious freedom, living under restraint "only in civil things." Two years later, a settlement called Pocasset was made on Aquidneck (now Rhode) Island by William Coddington, John Clarke, Anne Hutchinson, and others, who also sought religious freedom. Later, when trouble arose among them, the settlers separated; Mrs. Hutchinson and her followers remained in the original town (renamed Portsmouth), and Coddington, Clarke, and their friends founded Newport. In 1643 another settlement, Warwick, was founded by Samuel Gorton, John Greene, and others who had left Providence because they believed that true liberty could exist only within the established English law. Roger Williams, seeing that a union was necessary to protect the settlements from the aggressions of the neighboring colonies, secured a charter from the English Parliamentary Commission headed by the Earl of Warwick in 1644. This united them under the name of "Providence Plantations." In 1663 the charter of "Rhode Island and Providence Plantations" was granted by Charles II, and it remained the law of the colony and state until 1842.

Like William Penn, Roger Williams had

strict regard for the rights of the Indians, and maintained cordial relations with them. For many years, he kept the Narragansetts friendly to the English, but as the old chiefs died and the younger men felt the increasing menace of the English invasion of their lands, his influence lessened. Of the various Indian uprisings which occurred, the most disastrous was King Philip's War. In 1675 the settlers defeated the Indians in the Great Swamp Fight, which occurred at South Kingstown. From then until the Indian leader's death near Mount Hope in 1676, the Indians burned towns and massacred colonists, causing great suffering in the settlements on the mainland.

Independence. First to declare its independence of Great Britain, Rhode Island claims also to have committed the first act of violence against the mother country. During the Revolution, Stephen Hopkins and the other Rhode Island delegates to the Continental Congress played an important part in securing a Continental Navy, and Esek Hopkins, another native, became the first commander in chief. The colony also supplied the American cause one of its greatest military leaders, General Nathanael Greene. The most important event of the war occurring on its soil was the British occupation of Newport from December, 1776, to October, 1779. Raiding attacks were also made by the British against other Rhode Island communities, and an unsuccessful battle was fought by the American forces at Portsmouth in 1778. In 1780 about 6,000 French troops, brought to Rhode Island by Count Rochambeau to assist the Americans, were encamped near Newport. (See ROCHAMBEAU, JEAN BAPTISTE.) Rhode Island was the last (1790) of the thirteen original colonies to ratify the Constitution, insisting that amendments be made recognizing the rights of the smaller states.

Statehood and Growth. After the introduction of cotton manufacturing in 1790, and especially after the Jefferson embargo of 1807, industries multiplied rapidly, and Rhode Island soon became a leading industrial state. Many who had lived in the country moved into the cities and towns to become mill-workers. However, the system of government and representation, designed for agricultural communities, remained unchanged. About 1840, dissatisfaction in the cities led to a political struggle headed by Thomas W. Dorr, which resulted in the "Dorr Rebellion." This led to the adoption of a constitution resembling the more democratic "Freeman's Constitution" of 1842.

During the War between the States, Rhode Island sent men and supplies to the Union Army. It also provided a distinguished general, Ambrose E. Burnside. From the beginning of that conflict, the state expanded steadily, improving its manufacturing methods, its transportation facilities, and its cultural agencies.

Since then, it has kept abreast of the times in the enactment of social legislation. From time to time, it passed laws prohibiting the sale of liquor, and in 1885 a prohibition amendment was added to its constitution. This was repealed in 1889, however, and when the Federal amendment was later submitted, the state failed to ratify it. In 1884 the United States Naval War College was established at Newport. In 1941 one of the largest naval air stations in the United States was established at Quonset Point. In the following year, a large naval advance base was constructed at Davisville as the Atlantic headquarters of the "Seabees" or Construction Battalion of the Navy Engineers.

W.G.R.

Related Subjects. The reader is referred to:

	CITIES	
Pawtucket	Providence	Woonsocket
	HISTORY	
Civil Liberties		Industrial Revolution
Colonial Life in America		Religious Liberty
Constitution of the U.S.		Revolutionary War
Dorr's Rebellion		Verrazano, Giovanni da
Indians, American		
	BIOGRAPHIES	
Aldrich, Nelson W.		Greene, Nathanael
Angell, James B.		Hutchinson, Anne
Burnside, Ambrose E.		King Philip
Butterworth, Hezekiah		Perry, Matthew C.
Channing, William E.		Perry, Oliver H.
Cohan, George M.		Richmond, Grace L.
Curtis, George W.		Stuart, Gilbert
Dorr, Thomas W.		Williams, Roger

LEADING PRODUCTS

Apple	Jewelry	Silver
Cloth	Hay	Textile
Cotton	Poultry	Wool
Granite	Rayon	Worsted
Grape	Rubber	

UNCLASSIFIED

Brown University

Narragansett Bay

Books for Adults

ERNST, JAMES E. *Roger Williams, New England Firebrand*. Macmillan, 1932. Detailed biography, based on a careful study of original documents in the British Museum.

Know Rhode Island (pamphlet). State Bureau of Information, 1932. Interesting facts about the state.

MINER, LILLIAN B. *Our State: Rhode Island*. Oxford Press, 1925. General information.

PRESTON, HOWARD W. *Rhode Island's Historic Background* (pamphlet). State Bureau of Information, 1933. Interesting treatment of the subject.

Rhode Island: A Guide to the Smallest State. Houghton, 1937. (American Guide series.) Factual material on the entire state.

UPDEGRAFF, FLORENCE M. *Traveler's Candle*. Harcourt, 1942. Story of colonial Rhode Island.

Books for Younger Readers

EMMETT, ELIZABETH. *The Land He Loved: A Story of Old Narragansett*. Macmillan, 1940. Story of a London boy who was sold overseas, and of his difficulties in early Rhode Island. *Secret in a Snuffbox*. Macmillan, 1941. Story of two colonial children who were sent from their home in Barbados Island to a small Rhode Island town.

SANCHEZ, MRS. NELLIE (Van de Grift). *Stories of the States*. Crowell, 1941. pp. 261-67. Tales of early exploration and settlement.

QUESTIONS ON RHODE ISLAND

(An Outline suitable for Rhode Island will be found with the article "State.")

About how many times larger would Rhode Island have to be to equal the size of Texas?

How many times would the population of Texas per square mile have to be increased to equal that of Rhode Island?

If the United States as a whole were as thickly populated as Rhode Island, how many inhabitants would it have?

Why is the state often referred to as "a cradle of religious freedom in the New World"?

How does the ratio of town dwellers to country dwellers emphasize the relative importance of industry and agriculture?

In what ways did each of the following play an important part in the development of the textile industry within the state: Samuel Slater, the rivers, transportation facilities?

Why is truck gardening such an important phase of agriculture?

Name the most important seafoods taken from the coastal waters of Rhode Island.

For what was each of the following persons important: Roger Williams, King Philip, Moses Brown, Nehemiah Dodge, Ann Franklin, Thomas Bray, George Henry Corliss, Mary Dyer?

Why has the cotton industry of Rhode Island decreased in importance since 1910?

In what ways has Narragansett Bay had an important influence on the lives of Rhode Islanders since early days?

Account for the fact that great numbers of immigrants settled in Rhode Island during the latter years of the nineteenth century and the earlier years of the twentieth.

Is it true that Rhode Island has always been a great center of development in the arts and crafts? Explain.

What argument can you advance to prove that Rhode Island has always had a well-developed social sense?

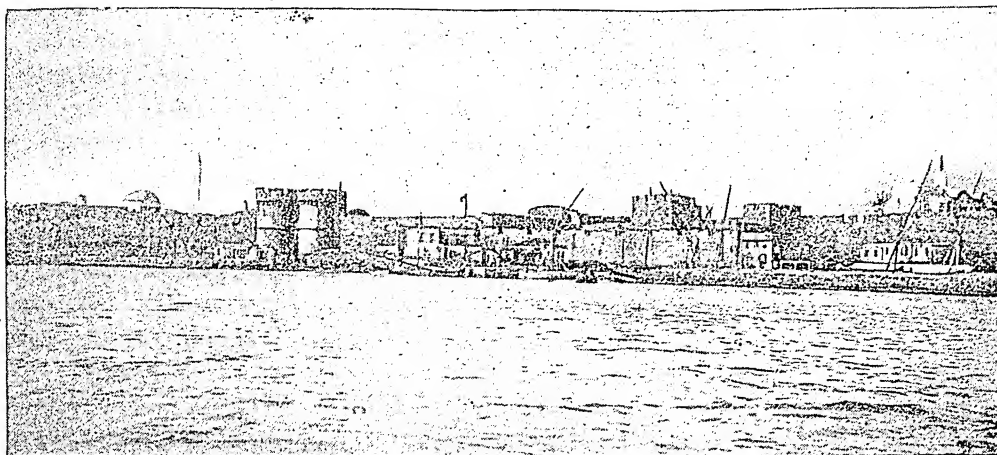


Photo: Visual Education Service

FORTRESS AND TOWER OF RHODES

RHODE ISLAND SCHOOL OF DESIGN, a coeducational institution specializing in commercial, industrial, and fine arts, on the principle that these three fields profit by sharing with each other the knowledge of ideas and techniques peculiar to each separate branch. Located in Providence, and founded in 1877, the Rhode Island School of Design curriculum includes courses in textile, jewelry, and machinery design; architecture, the fine, applied, and graphic arts; costume design; and interior decorating. Evening extension courses are offered throughout the year.

Of special interest is the school's Museum of Art. Here the visitor may see outstanding exhibitions of textiles, pottery, fine laces, embroideries, jewelry, and the paintings of many well-known artists. Examples of Classic, Renaissance, Gothic, Chinese, Japanese, and Persian art are also displayed. Adjoining this building is the Colonial House, home of the famous Pendleton collection of antique furniture, china, paintings, and other art objects.

RHODES, *rohds*, a volcanic Mediterranean island belonging to Italy. It lies twelve miles off the southwestern coast of Asia Minor, and is forty-nine miles long and twenty-one miles at the widest part; the area is about 424 square miles. The climate is temperate, and the valleys fertile, producing oranges, citrons, other fruits, and oil. Sponges are the principal export. A range of mountains runs through the length of the island, with Mount Ataijros 4,070 feet above the sea.

In early days, Rhodes was a wealthy and independent state of Greece, famous for its poets, artists, philosophers, and for its *Colossus*, which was considered one of the Seven Wonders of the World (which see). In 1309 the Knights Hospitallers of Saint John made it their stronghold and held it against repeated attacks till 1522, when they were compelled to abandon

the island to the Turks. In Turkish hands its glory departed, and few signs of its former grandeur remain.

During the Turkish-Italian War of 1911-1912, Italy occupied Rhodes. By the treaty which followed, Turkey ceded Rhodes and fourteen other Aegean Islands to Italy. Under the direction of Italy, surveys for archaeological specimens have been carried on, and a museum established at Rhodes, the capital city. Since 1935, Rhodes has been a hospital and munitions center. Seaplane bases, airdromes, and harbor installations were destroyed on this Italian stronghold by British and American bombers in World War II (which see).

RHODES, CECIL JOHN (1853-1902). During the period of his lifetime, this colonial administrator and builder of an empire was England's most eminent representative in South Africa. He was born at the vicarage of Bishop Stortford, in Hertfordshire, and received his elementary education in the grammar school there. Prevented by ill health from entering college, he was sent, in 1870, to his brother, a planter in Natal, South Africa. The next year, Cecil departed to the Kimberley diamond mines, where, within two years, he amassed a fortune.

His health restored, he determined to have the university education which earlier he had



Photo: Brown Bros.

CECIL RHODES

South African empire-builder, and founder of the Rhodes Scholarships.

been compelled to forego, and from 1876 to 1881 spent half of each year at Oxford, where he was graduated in 1881. Meanwhile, he succeeded in combining into the De Beers Consolidated Mines most of the companies operating in Kimberley.

In 1881 Rhodes was elected to the Cape assembly, and at once set himself to the task of advancing British imperial authority in South Africa. Bechuanaland was annexed to the British possessions in 1884 through his efforts, and four years later, valuable concessions were gained from the Matabeles, who practically surrendered to England the territory known as Rhodesia (which see). Of the latter, the British South Africa Company was put in charge, and Rhodes was the dominant influence in the company.

As premier of Cape Colony, an office to which he was chosen in 1890, Rhodes planned and promoted the Cape-to-Cairo Railway, did his best to bring about local self-government, and crushed a serious rising among the Matabeles. At first he labored to establish friendly relations between the Dutch and English colonies, but later, when it seemed that English expansion must be at the expense of the Dutch, he did not hesitate to interfere in the politics of the Transvaal, and thus was in a large measure responsible for the Jameson Raid of 1895. He resigned his position as a result of that unfortunate incident, and withdrew to Rhodesia, where his influence was still paramount. In a second outbreak among the Matabeles, he again proved his courage and his knowledge of men. From 1898 Rhodes attempted to extend the Cape-to-Cairo Railway northward and to promote the African continental telegraph system. When the South African War broke out, he was at Kimberley, where he assisted in the defense of the city. He died before peace was restored; his grave in South Africa is shown here.

As important as any feature of Rhodes' life work was his will, by which he left his fortune to public service. Most important of his bequests was that to his *alma mater*, Oxford University, for scholarships.

Related Subjects. The following articles in these volumes will give additional information and make clearer the references above:

Cape-to-Cairo Railway

Jameson, Leander Starr

Matabele
Rhodesia
Rhodes Scholarships
South African War

Transvaal
Union of South Africa
Victoria Falls

RHODES, COLOSSUS OF. See COLOSSUS; RHODES; SEVEN WONDERS OF THE WORLD.

RHODESIA, *ro de' zhih ah*, an inland African

possession of the British Empire, named after Cecil Rhodes (which see). Rhodesia is situated in South Africa, lying south of Belgian Congo. It is divided into Northern and Southern Rhodesia, the latter being the more fully developed of the two. Northern Rhodesia has an area of about 290,320 square miles, and

an estimated native population of 1,366,641 (1940). About 15,188 of the inhabitants are Europeans. The seat of government, long located at Livingstone in the extreme south, was moved to Lusaka, which is thirty miles north of the Kafue River. Southern Rhodesia has an area of about 150,333 square miles, and a population of 1,448,393 (1941), of whom 69,013 are Europeans. The seat of government is at Salisbury, east of Livingstone.

Each section has its own governor, and Southern Rhodesia has a representative assembly, while Northern Rhodesia has an executive council. Until 1923, Northern and Southern Rhodesia were under the administration of the British South Africa Company. In that year, the company relinquished its land rights in Rhodesia to the Crown,

though retaining its mineral rights, for the development of which it had spent large sums. Southern Rhodesia was formally annexed to the British dominions in September, 1923, and Northern Rhodesia was placed under British jurisdiction in April, 1924. For relinquishing its title, the company was paid £3,750,000. Rhodesia resisted vigorous efforts made to induce it to join the Union of South Africa, the two sections preferring the status of a British

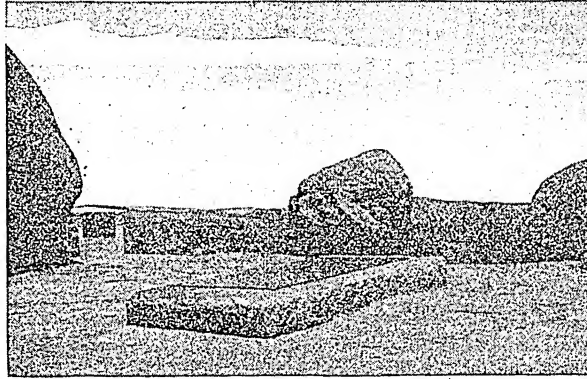
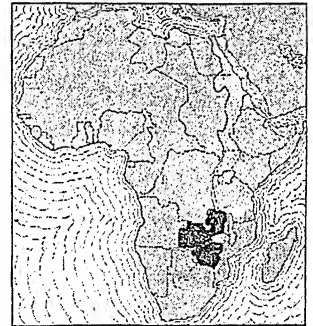


Photo: Visual Education Service

GRAVE OF CECIL RHODES



LOCATION OF RHODESIA

protectorate and a self-governing colony, respectively.

Both sections are rich in minerals, with gold, copper, zinc, coal, iron, lead, vanadium, and asbestos leading. The usual agricultural products of temperate zones are found in each section, and there is also some cotton; oranges are becoming an important source of income. Diamonds are mined to a limited extent in the south.

There are several branches of the Rhodesian Railway system in the protectorate, and the country is traversed by the Cape-to-Cairo Railway (which see).

RHODES SCHOLARSHIPS, a system of scholarships founded by Cecil John Rhodes (1853-1902), by which students from the British Commonwealth and the United States are entitled to three years' residence and study at the University of Oxford, England. Since 1930 Rhodes scholars have had the choice of spending the third year in residence at some other university under conditions approved by their own college and the Rhodes trustees.

The scholarships are apportioned annually in the following manner: Canada, 10; Australia, 6; New Zealand, 1; Union of South Africa, 12; Rhodesia, 9; Jamaica, 1; Newfoundland, 1; Bermuda, 1; United States, 32. Every three years one scholarship is allowed to the island of Malta. Scholarships have also been awarded to Germany. In 1940 plans were made for two scholarships for India, effective after World War II. Due to the operation of the United States Neutrality Act, making it illegal for American citizens to enter the war zone, American Rhodes scholarships were suspended in 1939 for the duration of the war. German scholarships, discontinued during World War I (1914-1918) and restored in 1930, were again suspended in 1939. Appointments continued to be made in the British Dominions.

The Rhodes foundation represents the supreme purpose in the life of the great colonial statesman, himself an Oxford man—to upbuild and perpetuate the British Empire, and to effect a closer union among the English-speaking people of the world.

Selection of Scholars. Mr. Rhodes specifically stated that he did not desire mere "book-worms" to enjoy the scholarship advantages, but that the students selected should be all-around men, of superior scholarship, outdoor and athletic tastes, and high character, and should be unmarried. The age limits set by the will were from nineteen to twenty-five. It was desired to select men old enough to appreciate the benefits of residence at Oxford, and young enough to be adaptable. The mode of selection was left in the hands of committees in the various jurisdictions.

Candidates from the United States must be citizens with at least five years' domicile,

and must have completed at least the sophomore year at some recognized university or college of the United States by October of the year for which they are elected. For purposes of selection, the country is divided into eight districts of six states each. A competition is held in every state annually before a state committee of selection. The successful candidates then appear before the district committee, which chooses not more than four men. See **RHODES, CECIL JOHN**.

RHODIUM, *ro' dih um*. See **CHEMISTRY** (The Elements).

RHODODENDRON, *ro doh den' dron*, a genus of trees and shrubs belonging to the heath family. The name means *rose tree*. The



Photo: Visual Education Service

RHODODENDRON

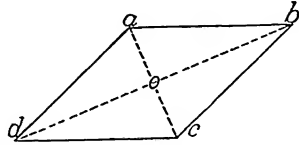
group includes several species which are known for the beauty of their flowers and for their evergreen foliage. One of the best-known is the *great rhododendron*, also called *great laurel* and *rose bay*, which grows profusely in the Allegheny Mountains and there forms almost impassable thickets, through the interlocking of the branches. This rhododendron is a shrub or small tree that rarely grows higher than thirty-five feet. Its large, white or rose-colored, bell-shaped flowers, when seen against the background of glossy evergreen leaves, are magnificently beautiful. Another species, the *catawba rhododendron*, is a shrub that is common in Virginia. It produces brilliant, lilac-purple flowers, and is a popular plant in the gardens of large estates, great numbers being shipped north for transplanting. Other species are found in the Pacific-coast region, and some magnificent specimens grow in the Himalayas and other mountainous regions of India. Numerous varieties have been developed by nurserymen. The states of Washington and West Virginia have adopted the rhododendron as their flower emblem. See **AZALEA**. B.M.D.

Scientific Names. The rhododendrons belong to the family *Ericaceae*. The great rhododendron is *Rhododendron maximum*; the catawba is *R. catawbiense*.

RHODOPE, *rod' o pe*, MOUNTAINS. See BULGARIA (The Land and Its Resources).

RHOMBOID, *rom' boyd*. See QUADRILATERAL.

RHOMBUS, *rom' bus*, a quadrilateral having four equal straight sides. A rhombus may be converted into a rectangle of the same base and altitude as the rhombus (see *Parallelogram* under MENSURATION). Therefore the area of a rhombus is equal to the area of a rectangle having the same base and altitude as the rhombus. Note that the altitude is the perpendicular distance between the base and the opposite side.



[Explanation of the figure is given in the text.]

The area of a rhombus is also equal to one-half the product of its diagonals. This may be seen from the accompanying illustration.

The rhombus is divided into two equal triangles, *abc* being the base of each of them, *ob* the altitude of one, and *od* the altitude of the other. Area of triangle $abc = ac \times \frac{ob}{2}$. Area of triangle $adc = ac \times \frac{od}{2}$. Area of rhombus $= ac \times \frac{bd}{2}$.

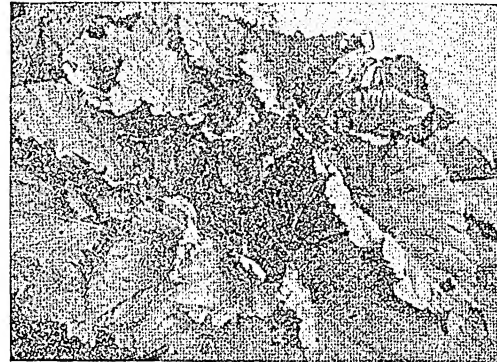
Not all mathematicians agree on the meaning of the term *rhombus*. Rhombus is defined by two leading writers thus: "A parallelogram that has two adjacent sides equal." "A rhombus is an equilateral parallelogram." These are variations of the one given above, and include the *square* in the term. Some older writers would exclude the square and restrict the meaning of rhombus to an equilateral parallelogram whose angles are not right, but such restriction is not in accordance with the best modern practice. Thus the definition given at the opening of the article is the one most generally accepted. J.W.V.

RHONE, *rohn*, RIVER, the most important commercial waterway of France, is famous for the beauty of its wooded banks. It rises in Switzerland in the Rhone glacier, from which it issues as a torrent at an altitude of 5,909 feet. After flowing through Lake Geneva and southwest to the city of Lyons, France, the river turns abruptly south, forms a large delta, and empties into the Golfe du Lion (misnamed Gulf of Lyons), an arm of the Mediterranean.

The river is 500 miles long and is navigable for 350 miles; its chief tributaries are the Saône, which meets it at Lyons, the Isère, and the Durance. By a series of great canals, navigation from the Rhine, the Seine, the Loire, the Meuse, and Belgian canals is continued to the Rhone, making it the great artery of river traffic to the Mediterranean—the chief commercial waterway, possibly excepting the Danube, leading from Europe to Asia.

Greek and Latin civilization followed the Rhone Valley from the Mediterranean to Lyons, and along the course of the river are many historic cities. The clear blue of the river, after it leaves Lake Geneva, inspired Byron's phrase, "the blue rushing of the arrowy Rhone."

RHUBARB, more familiarly known as **PIEPLANT**, is a perennial herb whose reddish, juicy leafstalks, stewed with sugar, furnish a



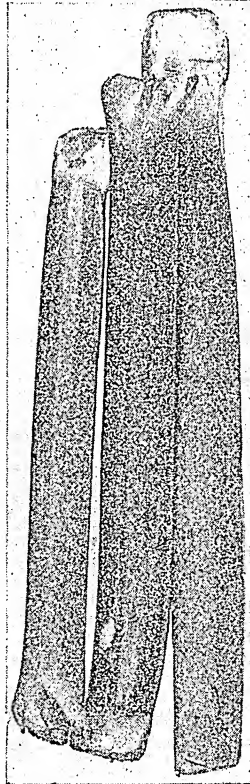
RHUBARB

The leaves are conspicuous, but only the stalks are edible.

tart sauce and an appetizing filling for pies which wise cooks give their families before the fresh fruits are in season. The plant is botanically related to the sheep sorrel, dock, and buckwheat.

It is only within a century or so that the stalks have been used in cooking. When the plant was introduced into England, in Queen Elizabeth's time, the leaves alone were gathered for use as a pot herb, but the roots were valued as medicine. To-day the tonic and laxative properties of rhubarb are fully appreciated. Water and cellulose make up over ninety-six per cent of its composition; cellulose

provides roughage, and with water has laxative effects. Valuable mineral salts, necessary for body regulation, are found in rhubarb, and it contains citric and malic acids that in this form are beneficial to persons in normal health.



It also contains the scurvy-preventing vitamin (see VITAMINS). In many homes, the plant is canned for use in the winter, and some people make the juice into a wine.

The common garden rhubarb came originally from China or Southern Siberia, but is now cultivated extensively in other cold or temperate countries. Warm climates are not favorable to its growth. The plant is propagated by dividing the roots of an old plant, although it can be grown from seed.

The plants must be two years old or more before the stalks can be gathered, depending on the method of propagation. The stalks are most tender and juicy when raised by the forcing process. The usual method is to set the roots one spring in deep, rich soil, dig them up in the late fall, and then force them, either in greenhouse or cellar, or in a hotbed improvised out-of-doors by covering the roots with a barrel, box, or flowerpot, closely banked with manure. The choice product that will be ripe by early spring finds a ready sale.

In Europe, the most common use to which rhubarb is put is as an ornamental plant in gardening, for its huge leaves with their rippling outline make most effective borders and back-grounds. There are a number of species grown solely for this purpose.

The Rhubarb of Pharmacy. The bitter rhubarb root used as a cathartic has been known to the Chinese for over five thousand years, and comes from an Asiatic variety of the plant. It is, also, an astringent and a tonic. The Chinese still supply the highest grade, the true Oriental rhubarb, cultivating the roots for six years before using them. A cheaper and less potent drug is prepared from a similar variety grown in England and some other parts of Europe, and exported to America. At one time this was also used in dyeing French silks.

B.M.D.

Scientific Name. Rhubarb belongs to the buckwheat family, *Polygonaceae*. The botanical name of the common garden species is *Rheum officinale*.

RHYME, rime, a word variously used in connection with poetry. The spelling *rhyme*, instead of *rime*, came about through confusion with the word *rhythm*. In a wide sense, rhyme is taken to mean poetry in general; or,

more specifically, one of the attributes of such poetry—the identity of sound in the last syllable or syllables of two or more words. At least one accented syllable must be included to make a true rhyme. *Blank verse* is always unrhymed. See RHYTHM; BLANK VERSE.

Rhyme is of comparatively late development, the Greeks and Romans having known nothing of it in their poetry, while in Anglo-Saxon poetry, its place as an ornament was taken by alliteration, the identity of initial consonant sounds. To-day, however, most literatures make use of rhyme; in some, indeed, as in French, it is absolutely essential to poetry. In English the vowel sound of at least the final syllable of rhyming words must be the same, and also the consonant sound which follows, if such there be, but the initial sound should by preference be different. Thus, *true* and *blue* rhyme; *approve* and *remove*; *number* and *slumber*; but *describe* and *ascribe* do not constitute a good rhyme because the *scr* sound is identical at the beginning of the rhyming syllables. It will be noted in the examples of rhyme words given above that in some instances the rhyme is in the last syllable only,

while in others it includes two syllables. The former kind is *single*, the latter *double*, rhyme. There may be, also, a *triple* rhyme, as in *identity*, *nonentity*, but it is seldom made use of in serious verse.

Of course, the aim of a poet is to make his rhymes perfect, but often there are found in good poetry such combinations as *pain, again*, or *none, own*, while some poets take great liberties with their rhymes. Thus, in Browning is to be found *fabric* rhymed with *dab brick*, while Lowell, in his *Fable for Critics*, makes use of such forms as *irresistible, whist table*. These last are humorously intended.

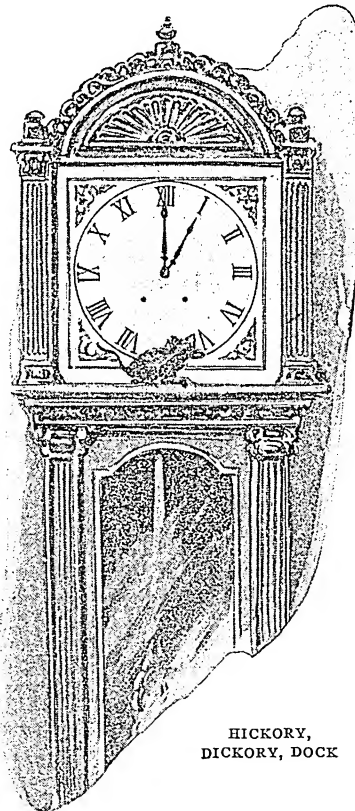
Rhymes usually occur at the ends of lines, though often they occur in the middle. This form is found in Shelley's—

Then I widen the *rent* in my
windbuilt *tent*,
And the calm rivers, lakes,
and *seas*

Like bits of the *sky* fallen
through me on *high*

Are paved with the moon, and with *these*.

RHYMES OF CHILDHOOD. For centuries mothers have sung *Bye Baby Bunting*



HICKORY,
DICKORY, DOCK



"OLD KING COLE WAS A MERRY OLD SOUL"

and fathers have recited *Ride a Cock Horse to Banbury Cross*, as they dandled young sons on their knees. Most nursery rhymes are of such great antiquity that their origin cannot be discovered by learned scholars. Children's love of nonsense accounts for many jingles which occur only in one language. The interest depends on the musical words rather than sense, and is untranslatable. An illustration:

Hickory, dickory, dock,
The mouse ran up the clock;
The clock struck one,
The mouse ran down.
Hickory, dickory, dock.

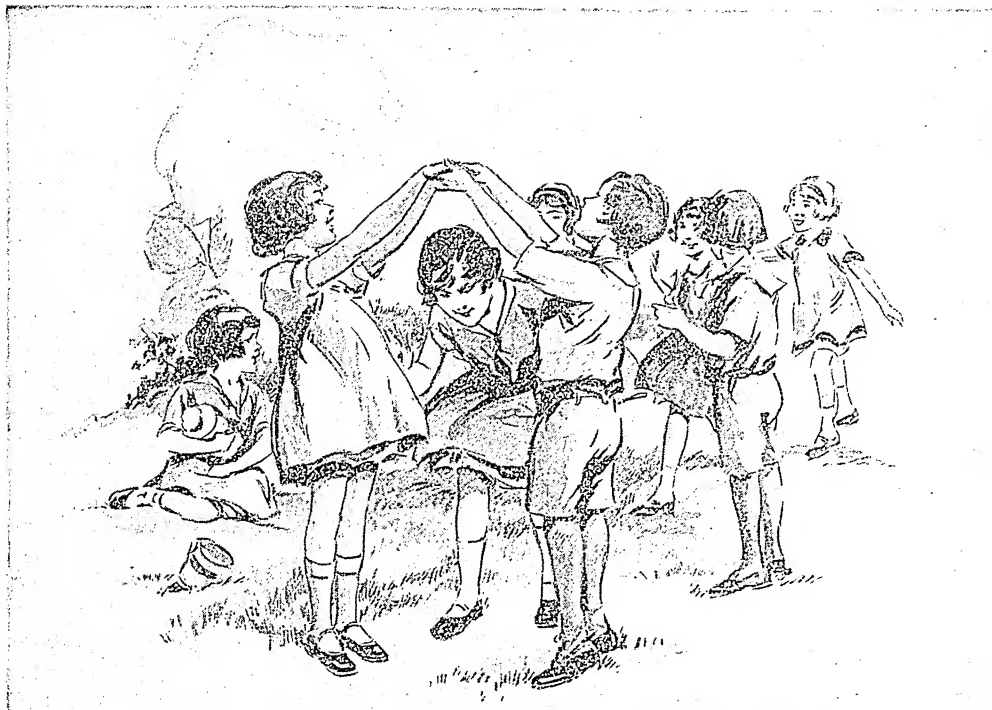
Other poems based on myth and legend appear in slightly different versions in the literature of every nation, and can be traced to early beginnings. The ever-popular *House That Jack Built* has its origin in an ancient

Hebrew folk story. Old superstitions in verse have been handed down from nurse to child for generations.

Historic events and beloved kings are the inspiration of some of the most familiar rhymes in the English language. King Cole, ruler of the Britons in the third century A.D., becomes, with a very small alteration in his name, the King Cole of the rhyme—

Old King Cole was a merry old soul;
And a merry old soul was he;
And he call'd for his pipe,
And he call'd for his bowl,
And he call'd for his fiddlers three.

Every fiddler had a fine fiddle
And a very fine fiddle had he;
Then twee twee-dee, twee-dee
Went the fiddlers,
And so merry we will be.



"LONDON BRIDGE"

A gay plan for the reconstruction of London Bridge was devised after it had been destroyed in the eleventh century by King Olaf, the Norseman, following his battle with King Ethelred. There is a surprising logic in the rejection of some of the fanciful suggestions listed here:

Dance o'er, my lady lee,
London Bridge is broken down,
With a gay lady.
How shall we build it up again,
Dance o'er, my lady lee,
London Bridge is broken down,
With a gay lady.

How shall we build it up again,
Dance o'er, my lady lee,
How shall we build it up again,
With a gay lady.

Silver and gold will be stole away,
Dance o'er, my lady lee,
Silver and gold will be stole away,
With a gay lady.

Build it up with iron and steel,
Dance o'er, my lady lee,
Build it up with iron and steel,
With a gay lady.

Iron and steel will bend and bow,
Dance o'er, my lady lee,
Iron and steel will bend and bow,
With a gay lady.

Build it up with wood and clay,
Dance o'er, my lady lee,
Build it up with wood and clay,
With a gay lady.

Wood and clay will wash away,
Dance o'er, my lady lee,
Wood and clay will wash away,
With a gay lady.

Build it up with stone so strong,
Dance o'er, my lady lee,
Huzza! 'twill last for ages long,
With a gay lady.



TAFFY

In the modern version of the poem, the refrain is in this form:

London Bridge is falling down,
My fair lady—o.

A Welsh uprising in the fifteenth century, when Owen Glendower descended upon the English border and made trouble for which he afterward paid dearly, is supposed to have inspired—

Taffy was a Welshman;
Taffy was a thief;
Taffy came to my house,
and stole a piece of beef.

I went to Taffy's house;
Taffy wasn't home;
Taffy came to my house,
and stole a marrow bone.

I went to Taffy's house;
Taffy was in bed;
I took up a marrow bone
and flung it at his head!

It would hardly be suspected that—

Little Jack Horner,
Sat in a corner,
Eating his Christmas pie;
He stuck in his thumb
And pulled out a plum
And cried, What a bright boy
am I!

is a tale of corruption in the days of Henry VIII. One John Horner, steward of Glastonbury, was sent to London with a pie for the king, which contained title deeds for several manors in Somersetshire. On the way, this greedy John Horner "stuck in his thumb"; in other words, abstracted for himself the deed for the Abbey of Mells, an estate formerly belonging to the Church. Another version has the pie sent to Queen Jane's brother, Edward Seymour, which dates the story about 1536 or 1537.

The legend does not seem fantastic

when it is noted that concealing surprises in pies was a favorite trick of the sixteenth century. A rare old book of recipes, *Eupatorio, or the Italian Banquet*, instructs a chef "to make pies that the birds may be alive in them and flie out when it is cut up." That can be considered a basis of fact for

Sing a song of sixpence,
Pocket full of rye,
Four and twenty blackbirds,
Baked in a pie;
When the pie was opened,
The birds began to sing,
Was not that a dainty dish,
To set before a king?

Military movements are sometimes described by self-evident propositions like

The King of France with twenty
thousand men,
Went up the hill and then came
down again;
The King of Spain with twenty
thousand more
Climb'd the same hill the French
had climbed before.

This rhyme is dated before 1588, but no one knows what specific event it celebrates. Another rhyme, which has reference to the failure of the English fleet against Cadiz, in 1625, is as follows:

There was a navy
went to Spain,
When it returned it
came again.

The advent of the House of Hanover in 1714 was celebrated by the disgruntled Jacobites, who supported James III and considered George I a foreign usurper, with the following jingle:

Hark, hark, the dogs
do bark,
The beggars are coming to town;
Some in jags, and some in rags,
And some in velvet gowns.



LITTLE JACK HORNER



"FOUR AND TWENTY BLACKBIRDS"



"THE KING OF FRANCE . . . CAME DOWN AGAIN"

Of more recent date and American origin are the adventures of Mary and her lamb, as recounted below:

Mary had a little lamb,
Its fleece was white as snow,
And everywhere that Mary went,
The lamb was sure to go.

He followed her to
school one day;
That was against
the rule;
It made the children
laugh and play,
To see a lamb at
school.

And so the teacher
turned him out;
But still he lingered
near,
And waited patiently
about,
Till Mary did ap-
pear.

And then he ran to
her, and laid her
His head upon her
arm,
As if he said, "I'm
not afraid,
You'll keep me
from all harm."

"What makes the
lamb love Mary
so?"
The eager children
cry;



"THE BEGGARS ARE COMING TO TOWN"

"O, Mary loves the lamb, you know,"
The teacher did reply.

"And you, each gentle animal
To you, for life, may bind,
And make it follow at your call,
If you are always *kind*."

Mary Elizabeth Sawyer, the "Mary" of the

poem, was followed to the "old Redstone Schoolhouse" near Sterling, Mass., by her lamb. John Roulston was the author of the first twelve lines; Polly Kimball was the teacher who turned the lamb out of school; Sarah Josephine Hale was the author of the last three stanzas. The "old Redstone Schoolhouse," which is an ordinary wooden country-school building named for its site on Redstone Hill, was moved from Sterling to a side road near Longfellow's Wayside Inn at Sudbury by

Mr. and Mrs. Henry Ford, who had discovered the schoolhouse and its story. Two boulders in the schoolyard bear bronze memorial tablets. On one is a facsimile of the pages from the school reader giving the "Mary's lamb" lesson, and on the other is an inscription to the principal personages of the story.

RHYTHM, *riht' m*, a measured or timed movement applied to the dance, to music, and to poetry. Regulated succession of long and short syllables was the distinguishing feature of Greek and Latin verse. Time was the essence of Latin and Greek verse, while accent is more widely used in modern versification. Milton's effects in his blank verse are increased by his metrical pauses. See **RHYME**.

RIALTO BRIDGE. See Venice.

RIBAUT, re' bo, JEAN (about 1520-1565), a French colonizer, born at Dieppe. In 1562 he led an expedition to America for the purpose of founding a Huguenot colony. After building Fort Charles, near the present Beaufort, S. C., he returned to France, leaving the settlement in the care of twenty-six colonists. They eventually abandoned the colony, and in 1564 Ribault sailed for America to take charge of a Protestant settlement at Fort Caroline, on the Saint John's River. His fleet of seven vessels was attacked by a French squadron while he was at the fort, and his attempt to make a counter-attack was prevented by a storm that wrecked his ships. Subsequently, he and his men were put to death. See **UNITED STATES** (Summary of United States History).

RIBBENTROP, JOACHIM VON (1893-), German statesman born at Wesel. Instrumental in making Hitler Chancellor in 1933, he continued a most trusted adviser. Thereafter, as ambassador at large and as Foreign Minister (1938), he was responsible for much that led to the rise and menace of Nazi international power. He promised Nazi satellites an early victory and rich rewards for aiding Germany in World War II (which see). See also **GERMANY** (Germany and World War II).

RIBBON, *rib' un*, a narrow, woven fabric with selvedge edges, and of any width up to nine inches. The distinguishing feature of a ribbon is really a technical part of the manufacturing process: on an ordinary loom, only one width of cloth is woven at a time; whereas, on a ribbon loom, at least two widths are woven side by side. As many as forty different ribbons can be woven at the same time, on some modern looms. Figured or patterned work is woven on Jacquard looms.

The manufacture of ribbon is a distinct branch of the textile industry. Hand looms on which several narrow "webs" could be woven at one time were in use at Danzig as early as 1600, and at Leyden a few years later. Ribbons are known to have been woven by hand in the eleventh century, near Saint Etienne,

France, which is to this day a center of ribbon-making. Basel in Switzerland, Crefeld in Germany, and Coventry in England are centers of the manufacture of ribbon. Seventy-five per cent of the American ribbon output is made in Pennsylvania and New Jersey.

RIBBON FALLS. See **YOSEMITE NATIONAL PARK**; **WATERFALLS** (diagram).

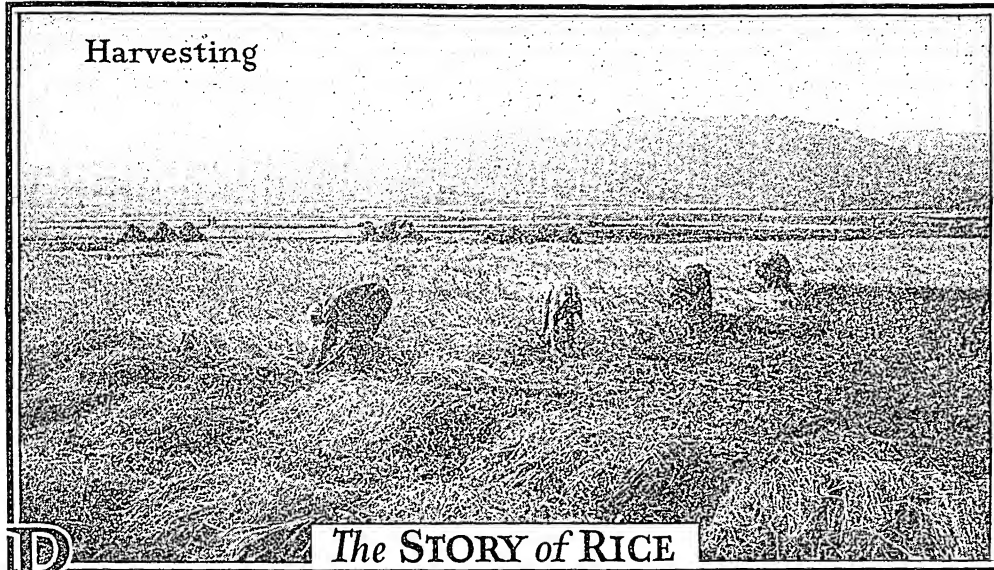
RIB GRASS. See **PLANTAIN**.

RIBS, twenty-four elastic bones enclosing the chest, giving a round framework to the trunk. They are attached to the vertebral column behind; and fourteen of them are attached to the sternum, or breastbone, in front. In man, there are twelve ribs on each side of the body. The seven on each side that are attached by cartilage to the sternum are called *true ribs*, and the other five (on each side) are *false ribs*. The last two upper ribs are placed nearly horizontal, but the others are lower in front than behind. The spaces between the ribs are known as *intercostal spaces*. The ribs are easily broken. There is not much that the layman can do in the way of first aid in case of such a fracture. If the skin is not perforated, and if no alarming symptoms of internal injury are shown, a broad bandage about the chest, fastened to prevent movement of the ribs, so that the patient will depend upon abdominal breathing, is about all that can be done until a physician arrives. Frequently, an X-ray is necessary to determine the exact location of the fracture, and its extent. In any event, the patient should recline and remain as quiet as possible until expert aid can be obtained. See **SKELETON**.

RICARDO, re kahr' doh, DAVID (1772-1823), a British economist, born in London. His father was a Dutch Jew, but at the age of nineteen, the son turned from the Jewish religion, joined the Church of England, and married a Gentile. The father renounced him and threw him upon his own resources, but Ricardo was so shrewd in business that he made a fortune before his twenty-fifth birthday. After that year, he devoted more and more of his time to the study of political economy, and in 1809 wrote his first treatise on the subject, a discussion of the money question.

In 1817 he completed *Principles of Political Economy and Taxation*, a book that for more than half a century profoundly influenced all thinkers and writers in the field of economics. Among his theories the following are most important: that increase of wages does not raise prices; that profits can be realized only by a fall in wages; that profits are determined by the cost of the necessary food which is produced at the greatest expense, and that wages cannot in the long run exceed the least amount necessary for the well-being of the laborer. This last statement is often called the "iron law of wages." Ricardo entered Parliament in 1819, and remained a member until his death.

Harvesting



R

The STORY of RICE

ICE. Although many of the great world foods belong to the family of grasses, there is no more important member of that family than the extensively cultivated grass we know as rice. Half the population of the entire earth finds the greater part of its food in the seed of the rice plant. The popularity of the grain is far greater, however, in Oriental lands than in the countries of the western hemisphere. It is as natural to associate the thought of rice and chopsticks with Chinamen as to connect the idea of spaghetti and macaroni with Italians. Rice is more to Asia than corn and wheat are to North America.

An Ancient Grain and a Far Traveler. The ancestor of the rice we eat to-day was a wild grass fringing the lakes of India and Northern Australia, called by the Hindus *nivara*. The Latin name is *oryza*, from which our word is derived. How many centuries ago man first began to cultivate this prolific grass, no one knows. Many Hindu rites still performed with rice grains are so ancient that their original significance is now entirely forgotten.

The antiquity of rice culture in China is indicated by a ceremony dating back three thousand years before Christ, in which emperor and princes honored the rice-planting by sowing a handful of seed with their own hands. In Italy, rice was not cultivated until about twenty-five years before the discovery of the New World.

In 1647 an unsuccessful attempt was made to grow it in Virginia. The first romantic chapter of the story of the American rice industry, however, was written about 1680, when a Madagascar ship damaged by a storm took refuge in the harbor of Charleston, S. C. Before it sailed away, its captain presented the governor of the

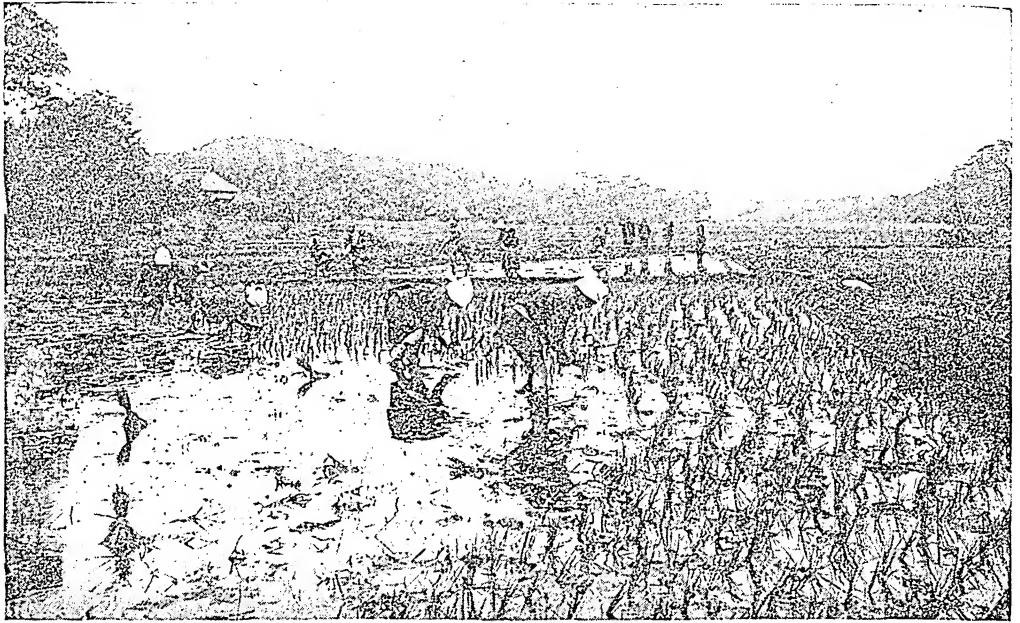
colony with a sack of seed rice, which was planted in various kinds of soil with such good results that the first crop yielded almost enough to supply everybody in South Carolina. From this chance beginning, rice-growing has spread



HOW RICE GROWS

to other parts of the United States, where soil and climate are adapted to the special needs of the plant. The temperature it requires for ripening is between 60° and 80° F.

Lowland rice, which must be grown in standing water during much of its life, may be



RICE-PLANTING IN JAPAN NEAR YOKOHAMA

classified as long grain, short grain, and medium grain, depending on the ratio of length to breadth of the kernel. These are distinct types and within these types are varieties. Representative of these in America are, respectively, the varieties named Fortuna, Caloro, and Blue Rose.

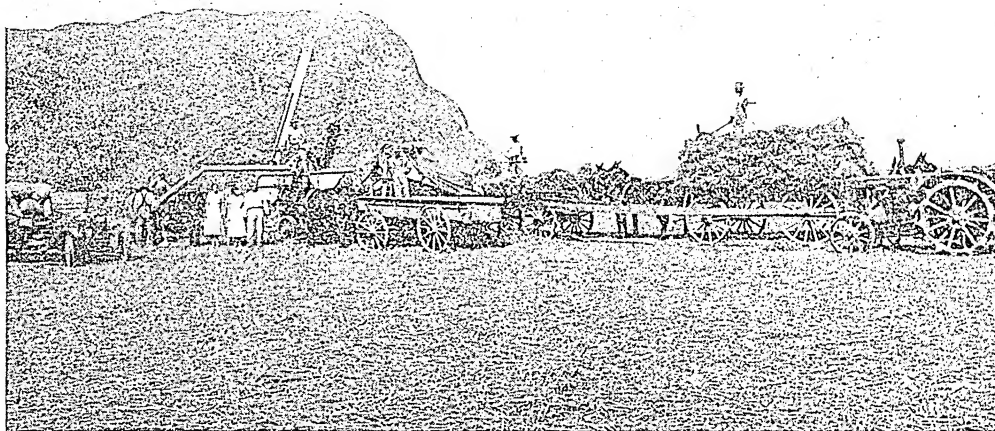
Its Thirsty Habits. Since rice traces its family history back to a shore grass, it is only natural to find that it has inherited habits of growth demanding a great deal of water. Except for this quality, it is like other cereals, resembling oats more closely than any other. The seeds are borne in a head called a panicle, which droops when the grain is fully ripe. It likes rich mud to root in, especially with a layer of clayey soil beneath to hold the moisture; and most of the time, except during actual cultivation, it is necessary to keep the ground flooded to a depth of many inches. At a distance, a growing rice field looks like an emerald lake.

The fertile deltas of great rivers—the Tigris, Euphrates, Ganges, Irrawaddy, Yangtze, Nile, and Mississippi—are marvelously well adapted to the needs of this aquatic grain, because they are subject to flooding from the overflow. So are the well-watered plains and river bottoms of India and China, and the low swamps and reclaimed tidelands of the South Atlantic and Gulf states. The Hawaiian Islands, the Philippines, Japan, Korea, Ceylon, the West Indies, and parts of Central and South America, are all good rice-growing districts because of their well-irrigated valleys and abundant rainfall.

Where there is less natural moisture there must be artificial irrigation; and, therefore, in the prairie regions of Texas, Louisiana, and Arkansas, great pumps operated by steam or gasoline bring water to the rice plantations from near-by wells and streams. In India, where drought and famine have afflicted the people for countless centuries, the British government is spending millions of dollars on irrigation canals. In many parts of China and Japan, the water is pumped up to the terraced rice fields by treadmills, at which men and boys, or blindfolded bullocks and water buffaloes, labor all day long. Often it is brought up in buckets passed from hand to hand. Where the country is rugged, as in certain districts of Java, China, and Japan, the mountain streams plunge from terrace to terrace, supplying natural irrigation.

Upland Rice. There is an upland variety that can be grown without water culture, in practically the same way as oats and wheat. Some claim that it is even superior in quality to the ordinary lowland rice, although it does not yield so abundant a crop.

The Rice Field and Its Cultivation. Ridges or embankments of earth divide the rice field into many smaller fields separated by canals equipped with dams, sluices, and floodgates, by means of which they can be flooded or drained, as the needs of the plants may require. Since salt water is fatal to rice, plantations which, like those of South Carolina, depend upon the tides for flooding, are situated sufficiently far from the sea to be free from salt water, and carefully protected by dikes. They are flooded



THRASHING RICE, CROWLEY, LOUISIANA

from the river at high tide and drained at low tide.

The great rice plantations of the Southern United States have introduced modern agricultural machinery, thus revolutionizing an industry which once received only hand cultivation. The South Carolina soil is too soft and marshy to permit the use of heavy farm machines, but that of the Texas and Louisiana rice region, artificially irrigated, is sufficiently solid to be cultivated according to the labor-saving methods which have made American agricultural progress the wonder of the world. Here the seed is planted with a machine drill. It is the general practice in the United States to place the seed in dry or moist soil, and no water is applied until after the plants have emerged. Contrary to the practice in the Orient where hand labor limits individual production to an acre or two, a rice farmer in America can take care of an eighty-acre tract. During the growing season the American farmer floods his level fields, but by harvest time the ground is usually solid enough to sustain the weight of the harvesting machinery. The process of cutting and binding is similar to that used with other grain crops.

In Oriental countries, the seed is usually sown broadcast in richly fertilized seed beds of half-liquid mud, and young sprouts are transplanted when they are two or three inches high. They complete their growing in standing water, the ground being kept soft by raking, or by a process of "hoeing with the toes," which is peculiar but effective. Full-grown rice reaches a height ranging from two to five feet.

Enemies of the Rice Field. Drought is the greatest enemy of rice. The spring freshets, which so often sweep away the young crop or

kill it with too much water, come second in destructive power. Harmful weeds thrive in the rice fields and must be carefully uprooted, a wild rice with red grains being among the most dangerous, since it spreads with amazing rapidity and greatly lowers the value of the crop. A bird enemy of the rice crop on the South Atlantic coast is the bobolink, which Southerners know as the *ricebird*; in Eastern countries it is a certain species of weaver bird, called the *Java sparrow*, or *paddy bird*. The insect which formerly did considerable damage to rice is called the *rice water weevil*, or the *rice root maggot*. It may be controlled by systematic drainage and drying of the fields.

Harvesting and Thrashing. When the rice straw begins to turn yellow, the field is drained to put it in shape for harvesting. In the United States, reaping machinery is used to cut the grain, and thrashing machines (see illustration) are used; in the Orient, the primitive sickle or a small knife is used. After stacking and drying the sheaves, the rice must be thrashed. In foreign rice-growing countries, crude methods are employed which have been handed down from generation to generation. In India, for instance, the heads are separated from the stalks by the trampling hoofs of oxen; in China, Japan, and many other places, by the slow and patience-trying process of drawing a handful of stalks across an iron comb set in a frame, or by striking an antiquated flail upon a thrashing floor.

Making Paddy into Rice. The thrashed rice is still *paddy*—that is, enclosed in a hull—and this husk, which "sticks closer than a brother," must be removed before the rice can be cooked or marketed. In the East the natives usually store the unhusked rice intended for home con-



EVERY STEP IN THE GROWING OF RICE IS MARKED WITH ARDUOUS TOIL

Country people in Japan are seen stripping the grains of rice from the stalks by drawing the latter through a frame set with iron teeth. This method has been employed by rice-growers in the Orient for many centuries, but modern machinery is gradually being introduced.

sumption and clean small quantities as needed. In some places, the husks are pounded off in stone mortars, sometimes worked by hand and sometimes by crude machinery. In other places, the paddy is stamped upon by animals or by coolies, beaten by flails, or ground off between millstones. The rice which is to be exported is husked at the mills by machinery, and Rangoon, in Indo-China, the greatest rice market in the world, has as modern a mill as any of the great rice centers of America. During the milling process, the rough grains are smoothed and polished between revolving bands of soft chamois or moose hide. After this process, they are graded according to size and barreled for shipment.

The Food Value. The polishing removes an exceedingly nutritious part of the grain—the fine flour put on the market as rice polish. The natives of rice-growing lands are usually too poor and too wise to insist upon the beautifully lustrous, pearly-white grains that their foreign customers demand, and the rice they eat is therefore a far more substantial food than our cereal. When they do make the polished grains their chief diet, they are liable to contract the disease known in Japanese as *beriberi-kakke*.

Rice has not the food value of wheat or corn, however, for it is deficient in fat and protein. It is principally meal or starch, and needs to be supplemented by other foods which are richer in fat and protein. Orientals usually combine

with it the sauce called *soy*, made from beans; Americans eat it with milk, syrup, or gravy.

Other Uses. The famous Japanese drink called *sake*, or rice wine, is fermented from the rice grains. In India they distill a liquor from rice which they call *arrack*, and the Chinese also use it in preparing various intoxicating spirits. A favorite hot-weather drink in India is rice water flavored with lemon and sugar. Rice bran, polish, and straw are used as fodder for pigs and cattle. A mixture of bran and polish is marketed as rice meal. Out of the straw, sandals, hats, and wrappers are manufactured, and the polish makes a valuable fertilizer. The hulls are used as we use excelsior. Rice starch is an important by-product. Rice paper, so-called, is misnamed, because it comes from an entirely different source—a small tree native to Formosa.

Canada, Wild, or Indian Rice. Along the edges of lakes in Canada and the northwestern portions of the United States, there grows wild a tall grass bearing long, black grains. This is *Canada rice*, or *Indian rice*, the favorite food of ducks, geese, and other wild fowl. Gathered by the Indians, it is eaten parched or as a porridge. It is marketed to a limited extent in the United States. There is a large demand for wild rice as a game food, but it is difficult to harvest, because the seeds ripen continuously throughout the fall months and drop into the mud as soon as they mature, so that gathering it involves daily trips.

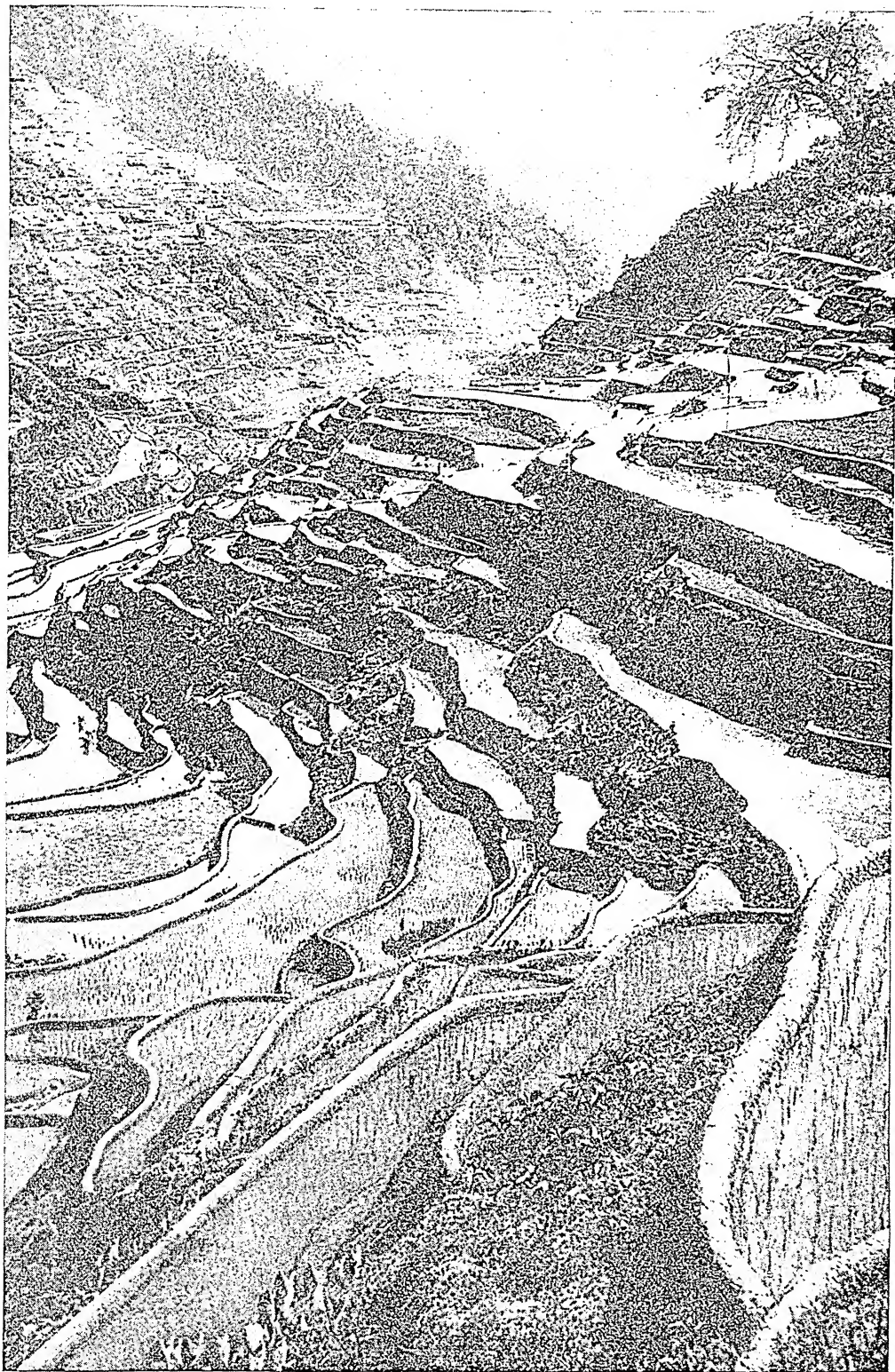


Photo: U & U

Where Hills Are Terraced for Rice Production. A view of wonderful rice terraces constructed by natives of the Philippine Islands in a mountain province.

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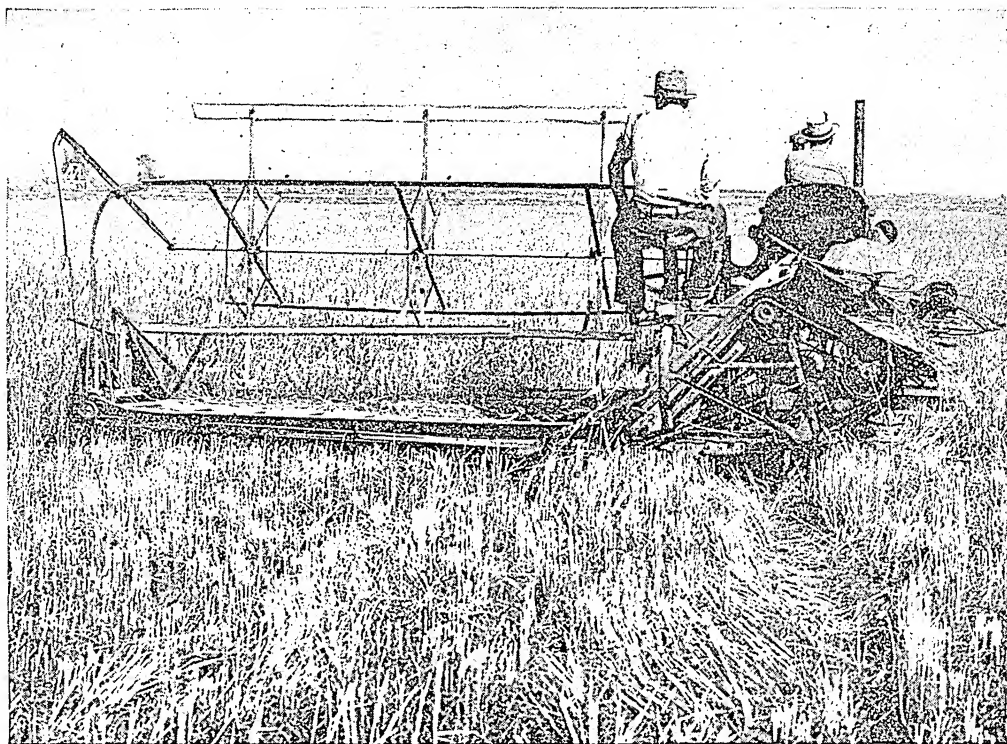


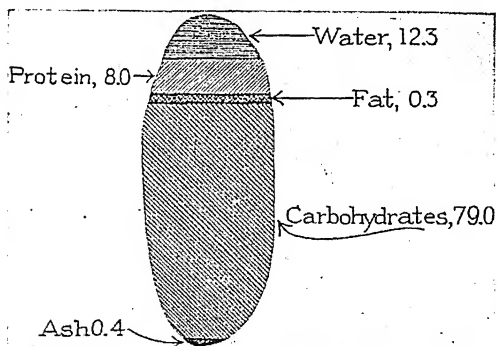
Photo: International Harvester Co.

HARVESTING RICE IN CALIFORNIA

World Production. The countries of Asia grow more than ninety per cent of all the rice raised in the world, which is estimated at 134

52,000,000 bushels of rice. This industry is growing steadily in importance.

In 1938, Louisiana led in rice production, its fields yielding 20,748,000 bushels. Texas was second with 13,668,000 bushels. Arkansas had 9,715,000 bushels and California, 8,375,000 bushels. There is some rice-growing also in Mississippi and Georgia. The industry declined in South Carolina, on account of the growing competition of the plantations where the use of machinery permits a vastly greater output.



COMPOSITION OF RICE

It has a fuel value, when boiled, of 510 calories per pound. This is only about one-third that of corn or wheat, but is equal to that of chicken or the average cut of veal.

billion pounds yearly. This does not include the crop of China, for which no figures are available. China is the largest producer; in many parts of the country two crops are raised each year, and a third one is started and turned under green as a fertilizer. The United States production now averages more than



LEADING SOUTHERN STATES IN RICE PRODUCTION

The star, in South-Central Louisiana, indicates the center of production.

California grew its first commercial crop in 1912, in the fertile Sacramento Valley, and already has a larger average production per acre than any other state.

The amount of rice exported by the United States has in recent years materially exceeded the amount imported. For 1938, 12,361,000 bushels were exported, mostly to Alaska, Hawaii, and Puerto Rico; imports were 2,429,000 bushels. The United States competes with India, Indo-China, Thailand, and Italy. Machinery has given a tremendous advantage over the power of man and oxen; it is this which has made American rice production increase so rapidly in a country where the industry is still relatively young.

Scientific Names. Rice belongs to the grass family, *Gramineae*. Its botanical name is *Oryza sativa*. Although wild rice belongs to the family *Gramineae* also, it is a distinct form, with the botanical name of *Zizania aquatica*.

RICE, ALICE CALDWELL HEGAN (1870-1942), an American story-writer, born at Shelbyville, Ky., and educated at Hampton College. She was married in 1902 to Cale Young Rice, a poet and dramatist. She wrote a few short stories which attracted no attention, but on the publication, in 1901, of *Mrs. Wiggs of the Cabbage Patch*, she became widely known. The sale of the book rose to 40,000 a month; it was translated into French, German, and Swedish, and was dramatized successfully. Its charm lies in its homely humor and its constant optimism, and these qualities appear in only slightly lesser degree in Mrs. Rice's later works—*Sandy, Lovey Mary, Mr. Opp, A Romance of Billy Goat Hill, The Buffer*, and others. *Turn About Tales*, a volume of short stories, is the joint work of Mr. and Mrs. Rice.



Photo: Brown Bros.

ALICE HEGAN RICE

RICE, HENRY MOWER (1817-1894), one of the first United States Senators from Minnesota after its admission into the Union. His statue, presented to Statuary Hall, Washington, D. C., in 1916, is a gift from that state. He was born at Waitsfield, Vt., and attended school at Detroit and Kalamazoo, Mich. He settled in Saint Paul, Minn., in 1848. Through his influence was secured the consent of objecting Sioux Indians to confirmation of the treaty of 1851, whereby all of Minnesota west of the Mississippi River and south of Ojibway County was opened to white settlers. When Minnesota was admitted as a state, Rice was elected to the Senate, serving from 1858 to 1863. Later, he acted as United States commissioner in the

making of treaties with the Indians. See **STATUARY HALL**.

RICE, JAMES, literary partner of Sir Walter Besant (which see).

RICEBIRD. See **BOBOLINK**; **RICE (Enemies)**.

RICE CONTINENT. See **GRAINS**.

RICE INSTITUTE. See **TEXAS (Education)**.

RICE WEEVIL. See **GRAIN WEEVIL**.

RICHARD, the Christian name of three English kings who ruled between 1189 and 1485.

Richard I (1157-1199), who reigned from 1189 to 1199, is known in history as **RICHARD THE LION-HEARTED** (Richard Coeur de Lion). He was the third son of Henry II, first king of the Plantagenet dynasty. Shortly after Richard ascended the throne (1189), he joined Philip Augustus of France in an expedition to the Holy Land. In 1192, while on his journey home, he was seized by Leopold, Duke of Austria, and confined in a castle on the Danube as a prisoner of Emperor Henry VI. There he remained until a heavy ransom was secured for his release. It is said that while he lay in prison his favorite minstrel Blondel made himself known by singing to his master outside the castle. This romantic tale, given more fully in these volumes in the article **BLONDEL**, is one of the many associated with the adventurous king. He also appears prominently in Scott's *Talisman* and *Ivanhoe*.

Richard returned to England in 1194, but did not take up the active administration of state affairs. Instead, he left the government to the care of a trusted Minister and engaged in a war with Philip Augustus of France. In 1199 he was killed during the siege of a French castle, and was succeeded by his brother John. During his entire reign, Richard spent little more than one year in England. Though a brave and accomplished man, he performed not one service for the good of his country. See illustration, page 1763.

Richard II (1367-1400) was ten years old when he succeeded his grandfather, Edward III. He was the



RICHARD THE LION-HEARTED

[From his gravestone.]



THE PRINCES IN THE TOWER (SEE RICHARD III)

second son of the Black Prince, and the nephew of John of Gaunt. The latter became the real ruler, and so heavily did he tax the people that a rebellion under Wat Tyler broke out in 1381. In quelling this insurrection, the boy king showed considerable spirit and courage. Wars and intrigues disturbed the rest of Richard's reign, and in 1399 he abdicated. The immediate cause of this event was his confiscation of the estates of his cousin, the Duke of Hereford, eldest son of John of Gaunt. Hereford raised an army against Richard and forced him to resign the crown, and it is supposed that he later had him put to death.

During the reign of Richard, Chaucer wrote his *Canterbury Tales* and Wycliffe made a translation of the Bible. Important political movements were the development of the Privy Council and an increase in the activity of Parliament. The Duke of Hereford succeeded to the throne as Henry IV.

Richard III (1452-1485), the youngest son of Richard, Duke of York, succeeded to the throne in 1483. His reign was brief and troubled, for he represented one of the two rival houses—Lancaster and York—whose struggles for the crown made up the annals of the Wars of the Roses. When, in 1483, Edward IV died, his little son became king as Edward V. This child was left to the care of his uncle, Richard, Duke of Gloucester, who became Protector of the kingdom. Soon after this, Richard began plotting for the kingship. He had the most powerful relatives of the queen mother arrested and beheaded, the boy king and his young brother were placed in the Tower, and an ignoble Parliament declared the Protector the rightful king.

A crown so gained could not be securely held, and the king was soon threatened by plots for the rescue of the imprisoned children. Richard probably tried to offset these plots by having the young princes murdered; at least the evidence points to his guilt in this cruel scheme. At all events, the people looked upon him as the murderer of his nephews, and a general uprising in favor of the House of Lancaster quickly took form. On Bosworth Field, in 1485, Richard's forces were defeated by an army under the Earl of Richmond, who became king as Henry VII. Richard himself was slain in the battle. For a striking, though exaggerated, view of Richard's character, the reader should study Shakespeare's great historical play, *Richard III*. See page 6114.

Related Subjects. The following articles in these volumes give added information on the periods covered by these reigns:

Blondel	Plantagenet
Crusades (Third)	Roses, Wars of the
Edward, the Black Prince	Shakespeare, William
John of Gaunt	Wat Tyler's Rebellion
Henry (IV, England)	Wycliffe, John
Lancaster, House of	York, House of

RICHARD II. An historical tragedy by William Shakespeare (which see).

RICHARD III. A play based on the War of the Roses by William Shakespeare (which see).

RICHARDSON, JOHN. See *CANADIAN LITERATURE* (English Canada: Fiction).

RICHARD SAUNDERS. See *POOR RICHARD'S ALMANAC*.

RICHARDSON, SAMUEL (1689-1761), the first of the great English novelists. He was

born in Derbyshire, where he received an elementary education. In his sixteenth year he went to London and became apprenticed to a printer, and after several years of service, in which he proved himself an industrious and careful worker, he went into business for himself. Richardson remained at this occupation until 1739, when he was engaged by two booksellers to prepare a collection of letters on subjects of interest to those unable to compose their own letters.

Richardson was a letter writer of some experience, for in his boyhood he had carried on correspondence for several Derbyshire young women. With a desire to make the proposed work as interesting as possible, he devised a plan whereby several imaginary persons exchanged letters, the whole forming a complete narrative. Thus his first novel, *Pamela*, was written. Published in 1740, when the author was over fifty, it is regarded by some critics as the first English novel, in the technical sense of the term.

The popularity of the book was immediate, and *Clarissa Harlowe*, published eight years later, met with an even more enthusiastic reception. Five years later appeared *Sir Charles Grandison*, which dealt with fashionable life, as *Pamela* had dealt with the lowest and *Clarissa Harlowe* with the middle class. The fact that the books were written in the form of letters makes these novels very long, and they are occasionally tiresome and overburdened with detail; on the other hand, the plan gave the author an opportunity to show his wonderful power of portraying character.

RICHARD THE LION-HEARTED. See *RICHARD* (I, England).

RICHBERG, DONALD RANDALL (1881-), co-author of the Act promulgated by the National Recovery Administration (which see).

RICHELIEU, *re sheh lyu'*, or *rees' eh loo*, **ARMAND JEAN DU PLESSIS**, Duc de, Cardinal (1585-1642), one of the most distinguished French statesmen, for eighteen years practically the absolute ruler of France. He was born in Paris of a family of the lesser nobility, who had for many generations sent their sons as proud warriors to the defense of France and its ideals. His father, through his valor in the religious wars, gained for himself the gratitude of Henry III, and for his son the office of bishop of Luçon. As a third son, Richelieu was destined to find a career in the army, but his elder brother, whose duty it was to enter

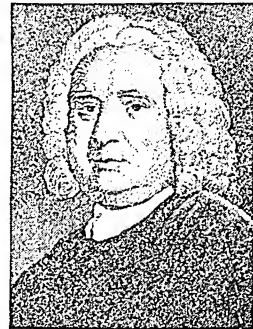


Photo: Brown Bros.

SAMUEL RICHARDSON

ecclesiastical life, refused the office, and the next eldest was already a monk of the Grande Chartreuse. In order to retain the revenues from this bishopric for the family, Richelieu abandoned the army and studied for the priesthood, an occupation better suited to his delicate health than military duties. Although almost five years under the canonical age, he was nominated bishop of Luçon in 1606, and the following year was consecrated by the Pope. In this office he proved zealous and able, but his abilities and ambitions were greater than his task, and he became impatient for advance.

His first taste of power came in 1614, when the clergy of Poitou elected him to the States-General, and he favorably impressed Maria de' Medici, the mother of King Louis XIII. When the States-General was dissolved, Maria retained the young bishop as court almoner, and in 1616, by faithful service and clever management, he was made a member of the Royal Council as Secretary for War and Foreign Affairs. But his power was short-lived, for the young Louis XIII was anxious for his throne and entered into a conspiracy which culminated in the murder of his Prime Minister, Concini, and the banishment of the queen mother.

Most Powerful Man in France. Richelieu's exile from the court was only temporary, and by his diplomacy he reconciled Louis XIII and his mother, and in the good graces of Maria de' Medici, he renewed his way upward, securing through her efforts the rank of cardinal in 1622. Two years later, she was finally successful in returning him to the Royal Council, making him Minister of State, the power behind the throne and the dominant influence in France. Foreign relations engaged his attention first, and he arranged a marriage between Henrietta Maria, sister of Louis XIII, and the Prince of Wales, thus securing a friendly alliance with England. At home he wanted to make royal power absolute, put down the rebellious Huguenots, and crush feudal nobility. He was not religiously intolerant and made no attempt to take away freedom of worship from the Huguenots, but he led in person the army in its fifteen months' siege of their stronghold, Rochelle, which submitted to him October 27, 1628. While destroying the political privileges of the Edict of Nantes,

he reaffirmed religious toleration, and thereby drew the loyal Huguenot officers to the support of his foreign enterprises.

One other domestic problem which he attacked was the independence of the feudal aristocracy, which he considered the greatest obstacle to absolute power of the ruler. He issued an edict in 1626, ordering all fortified castles not needed for defense against invasion to be destroyed. In this task he had the coöperation of the local authorities, who had long been oppressed by the arrogance and unreasonable demands of the powerful landlords.

It is natural to find some resistance to so rapid a rise in power and control, and the distaste of the nobles for Richelieu's curtailment of their influence manifested itself in plots against his person. Richelieu was usually aware of these conspiracies, and maintained a system of spies to forewarn him. The perpetrators of these plots he punished mercilessly.

RICHELIEU



His Influence in Europe. Richelieu's greatest achievements, however, were in foreign affairs, for he did much to restore to France the prestige it had had in the days of Henry IV. He realized that foreign victories and extension and security of frontiers strengthened national unity and monarchical power at home. If he could handle his foreign enemies, internal troubles would take care of themselves. When Richelieu came into power, Europe was embroiled in a religious war (see THIRTY YEARS' WAR), and in this dissension, he saw an opportunity for France. Henry IV had dreamed of crushing the Austrian Hapsburgs, time-honored enemies of France, but Richelieu's ambition was to make France supreme by the means most expedient and effective. The Austro-Spanish power had increased to a dangerous degree, and Richelieu resolved to support the German princes with subsidies and good will, and encourage them in the attack on the north. In the south he planned to help the Italians combat the encroaching Hapsburgs and Spaniards.

Richelieu's plans were temporarily interrupted by the Huguenot revolt mentioned above, and though this dragged him into a war with England against his will, his genius came to his rescue when all odds seemed against him. From 1628 to 1631, Richelieu engaged in a war with Spain and Italy over



From the painting by H. P. Motte

RICHELIEU AT ROCHELLE

the succession to the duchy of Mantua, and persuaded Louis XIII to lead 36,000 men across the Alps to establish Charles Gonzaga, Duke of Nevers, in his legitimate possessions. By the treaty of Bärwalde, on January 13, 1631, Richelieu agreed to pay Gustavus Adolphus of Sweden \$120,000 in consideration of his recent expenditures in the religious wars against the Catholic Hapsburgs, and a sum of \$400,000 a year for six years or until a general peace was made. Sweden's part was to keep an army of 36,000 in the field. Richelieu considered he was saving his country the enormous expense of a foreign war, but at the same time accomplishing the same purpose by subsidizing another to fight his enemy. However, he did not live to see the full results of his policy for the humiliation of Spain and Austria.

Summary. Richelieu's ability and accomplishments can only be appreciated when his handicaps and obstacles are taken into consideration. His king hated him, and as his power increased, so did the animosity of the court and even that of the queen mother. His greatest aid was his personality, and under that cover, he was able to convince the king that he was indispensable to the welfare of France, and that the king dare not dismiss him for fear of the consequences. His wit and cunning allowed him to put to his master's credit many of his own successes, when he knew the king to be plotting against him.

Though not robust in health or build, he had the bearing and haughty dignity of a prince, and in his red cardinal's robes, he was a figure to command the respect and deference

of all who saw him. Even those of nobler blood than Richelieu's hastened to clear the way to permit him to pass, and were subservient to his wishes and desirous of his favors. Although sometimes unscrupulous in his methods, his aim was always for the greatest good of France, whose boldest and most prudent servant he remained. To-day, only the memory of his greatness remains—the absolute monarchy he cherished so jealously has crumbled under the blow of revolution; his family, finally drifting into poverty, is extinct; and his gorgeous residence, the Palais-Cardinal, has become the Palais Royal, devoted to shops, cafés, and restaurants.

Richelieu's talents sought a wider scope than statesmanship, and he had a desire for literary fame. But though his writings were extensive, his greatest contribution to literature was his patronage and protection of literary men and the founding of the French Academy in 1635. He likewise rebuilt the Sorbonne and enriched it with endowments, and at his death on December 4, 1642, he was buried in the Sorbonne chapel.

Related Subjects. The reader is referred to the following articles in these volumes:

Academy	Mazarin, Jules
France (History)	Sorbonne
Huguenots	States-General
Louis (XIII, France)	Thirty Years' War

RICHELIEU RIVER, also known as the CHAMBLY, SAINT JOHN, and SOREL, a Canadian stream, the outlet of Lake Champlain into the Saint Lawrence River. Emerging from Lake Champlain a few miles north of the United

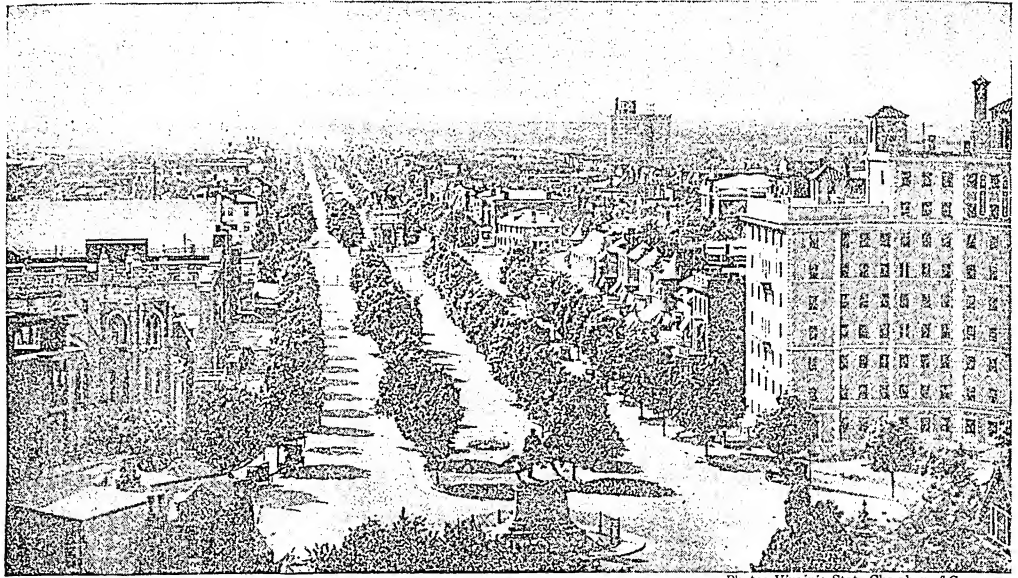


Photo: Virginia State Chamber of Commerce

LOOKING DOWN MONUMENT AVENUE, RICHMOND

On this beautiful street are monuments to Generals Jackson, Lee, and Stuart, and to Jefferson Davis. The view is from the top of Saint James Church.

States boundary, the Richelieu flows almost directly northward for eighty miles to the Saint Lawrence, which it reaches at Sorel, between Montreal and Three Rivers. It varies from 1,000 to 8,000 feet in width, and flows through a picturesque section which has added charm through many historical associations. The Richelieu is navigable from Sorel southward to Chambly; a canal from Chambly to Saint John makes it possible to avoid a series of rapids. See SAINT LAWRENCE, GULF OF; QUEBEC (Rivers and Lakes).

RICHET, *re sha'*, CHARLES. See ECTOPLASM.

RICHMOND, BOROUGH OF. See NEW YORK (City).

RICHMOND, CALIF. See CALIFORNIA (back of map).

RICHMOND, GRACE LOUISE SMITH (1866-), an American novelist born in Pawtucket, R. I., attended high school in Syracuse, N. Y.; studied under private tutors; received the degree of Doctor of Literature from Colby University in 1924. She was married in 1887 to Dr. Nelson Guernsey Richmond of Fredonia, N. Y. Mrs. Richmond is a frequent contributor of short stories to popular magazines, and is a member of various societies and guilds of authors, playwrights, and composers. Her novels, as well as her short stories, are characterized by a sympathetic treatment of life's experience and tribulations; though sentimental, her fiction is wholesome and interesting.

Representative Fiction. Mrs. Richmond's first novel, *The Indifference of Juliet*, appeared in 1905,

and was an immediate success. Others include *The Second Violin*, *Round the Corner in Gay Street*, *A Court of Inquiry*, the *Red Pepper Burns* series, *Strawberry Acres*, *The Twenty-fourth of June*, *The Brown Study*, *Red and Black*, *Foursquare*, *Rufus*, *Cherry Square*, *Lights Up*, and *The Listening Post*.

RICHMOND, IND. See INDIANA (back of map).

RICHMOND, VA., the capital, largest city, and commercial center of the state, and the county seat of Henrico County, is noted in history as the capital of the Confederate States of America. This fine old city is situated south and east of the geographical center of the state, 100 miles southwest of Washington, D. C., and 127 miles from the Atlantic Ocean, at the head of tidewater on the James River. Population, 193,042 (1940).

General Description. Spread over seven hills, Richmond has been called the "Modern Rome." However, the James is not a slow-moving, muddy Tiber, but a swift, sparkling stream, breaking into rapids with a fall of 100 feet in nine miles. From Gamble's Hill, one of the city parks, there is a magnificent view of Richmond's lovely natural setting. Islands dot the river, and hills rise in a series of terraces reaching a height of 250 feet above sea level. Gamble's Hill is one of eighteen parks in a system covering more than 900 acres. Capitol Square, a small park surrounding the capitol building, belongs to the state.

Buildings and Monuments. In Capitol Square is a monumental group designed by Thomas Crawford and Randolph Rogers. In

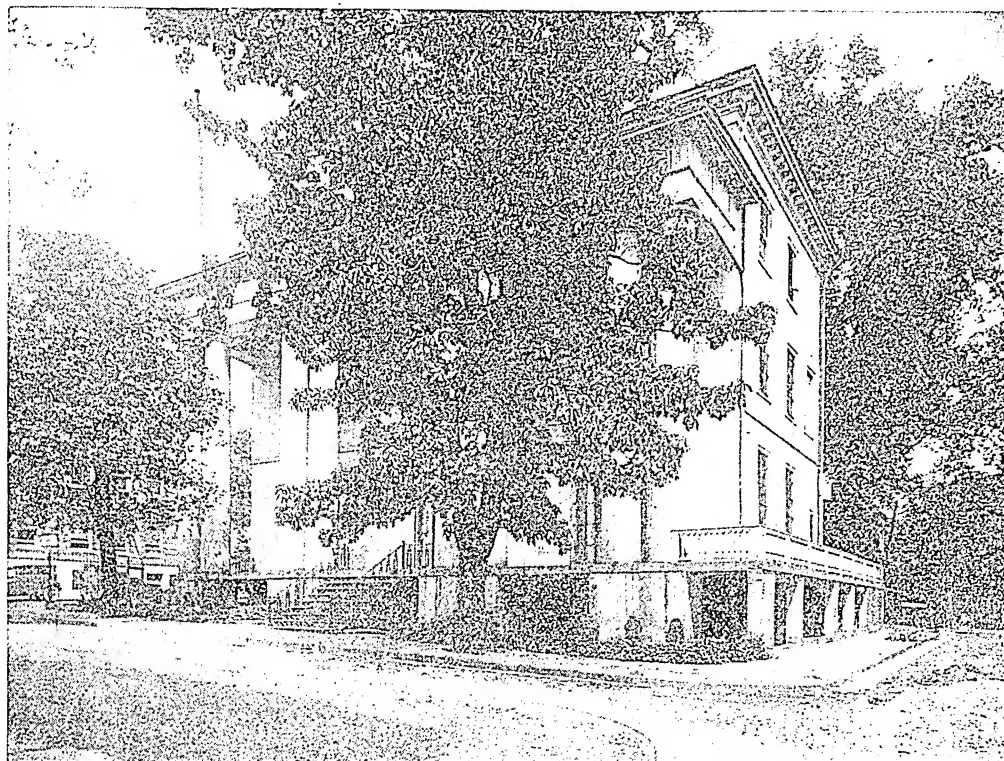


Photo: Virginia State Chamber of Commerce

WHITE HOUSE OF THE CONFEDERACY, AT RICHMOND

the center is an equestrian statue of Washington, with sub-statues of Patrick Henry, Thomas Jefferson, John Marshall, George Mason, Andrew Lewis, and Thomas Nelson. In the capitol, which was designed from plans of the Maison Carrée at Nîmes, supplied by Thomas Jefferson, are statues of Washington and Lafayette by Houdon. That of Washington bears an inscription written by James Madison.

The walls of Saint John's Episcopal Church resounded in 1775 to the stirring challenge of Patrick Henry, "I care not what course others may take, but as for me, give me liberty or give me death." The oldest house in Richmond, Old Stone House, a small cottage built before 1700, is the Edgar Allan Poe Shrine; Valentine Mansion, a nineteenth century edifice, is famous as the place where Aaron Burr dined while he was on trial for treason. It too is now used as a museum.

An imposing equestrian statue of Robert E. Lee stands in Lee Circle. Lee's memory is also honored by the preservation of his residence as the home of the Virginia Historical Society. The "White House" of the Confederacy now houses the Confederate Memorial Society. A monument to Jefferson Davis, with a statue of the President of the Confederate States below, stands not far from Lee Circle. The bravery of 16,000 Confederate

soldiers who lie buried in Hollywood Cemetery is commemorated by a tall granite pyramid. Many famous names are carved on the white tombstones in Hollywood—John Tyler, James Monroe, John Randolph, Jefferson Davis, Mathew Maury, and George E. Pickett.

Near Richmond is an old river plantation, Westover, widely known as the ancestral home of the Byrd family, though no longer possessed by its descendants. Harry F. Byrd, former governor, and Richard E. Byrd (which see), the explorer, are members of this old family.

Among the fine modern buildings are the city hall, city and state libraries, Federal Reserve Bank, post office, Sacred Heart Cathedral, and The Mosque, Richmond's civic center.

Education. Under one board of trustees and one president are Richmond College for men and Westhampton College for women. The two institutions constitute the University of Richmond. Each College has a separate dean. Union Theological Seminary (Presbyterian) was founded in 1812. T. C. Williams Law School, Medical College of Virginia, Mechanics Institute, Richmond School of Social Work and Public Health, and private and normal schools supplement the public-school system.

Railroads. Railroad transportation is furnished by the Southern Railway, Seaboard Air Line, Atlantic

Coast Line, Chesapeake & Ohio, Richmond, Fredericksburg & Potomac, and the Norfolk & Western.

Commerce and Industry. Steamships ply between Richmond and other ports along the Atlantic coast of the United States, affording opportunity for inter-coastal trade. The river furnishes an immense amount of water for industries located along its banks, thus greatly furthering production. An un-navigable canal, which extends around the rapids, is another source of water power.

Richmond is the leading industrial center of Virginia, one of the principal tobacco markets and manufacturing centers for tobacco products in the United States, and the largest manufacturing center in the world for blotters, stereotype paper, and bottled extracts. Iron and steel manufacturing is important, as well as the manufacture of fertilizers, wooden articles, flour, baking powder, and twine. There are also extensive wholesale and jobbing interests.

History. Captain John Smith and an exploring party left Jamestown in the early summer of 1607 and sailed up the James. He landed on one of the islands opposite the present site of Richmond. His attempt (1609) to establish a settlement in the vicinity failed. In the same year, the first settlement within the present limits of Richmond was founded and was known as Rocketts. Between 1645 and 1676, Fort Charles was built and the Battle of Bloody Run was fought. In this conflict, a band of 150 Indians was exterminated. It was not until sixty-one years later that Colonel William Byrd had the town of Richmond laid out. Colonel Byrd was an ancestor of Harry Flood Byrd, recent governor of Virginia, and Richard E. Byrd, Arctic and Antarctic explorer.

Richmond was laid out by William Mayo, for whom one of the islands in the James is named. The name Richmond was probably suggested by the site of Richmond on the Thames in England. In 1742 the place was incorporated as a town; in 1779 it was made the state capital; and in 1782 it was chartered as a city. Eight hundred British troops under Benedict Arnold captured Richmond with little resistance in 1781, and partly burned the city.

As the capital of the Confederacy (1861-1865), Richmond was the center of military operations. There were at least fifteen pitched battles and twenty skirmishes in and around the city. In 1862 it seemed in great danger of capture, and at the appearance of the *Monitor* on the James, President Davis asked for a day of prayer. Many citizens fled, and some of the state records were removed. However, Richmond was not evacuated until 1865, after months of siege. When the Federals entered it, General Ewell ordered that the warehouses and iron works be set on fire, and before the advancing Northern army occupied the city, it had suffered a great deal of damage. In addition to its prestige as the Confederate capital, Richmond had cast most of the cannon used by the Confederates. The Tredegar fac-

tory, in which the work was done, is still operated as an iron foundry.

In 1919 changes were made in the city charter which provided for departmental city government, each department having a director appointed by the mayor, subject to confirmation by the city council. The city comptroller and city attorney are elected by the people.

J.M.B.

RICHMOND BAY, the northern bay of Prince Edward Island (which see) in the Gulf of Saint Lawrence.

RICHTER, rik' tur, JOHANN PAUL FRIEDRICH, called JEAN PAUL (1763-1825), the man who made all Germany laugh as the nation's greatest humorist, and who was famed as a satirist. He was born at Wunsiedel, North Bavaria. His father, a clergyman, died when Jean Paul was sixteen. For three years (1781-1784), he attended the university at Leipzig. He had planned to follow his father's calling, but gave it up for literature. Unable to continue his university work, he returned to Hof, where he lived with his mother. Her only means of support was spinning, to which Jean Paul added the few florins earned by his writings. From youth he had been a great reader, always making copious notes. These, later in life, served him in the writing of his books. His conversational powers and his genial manner won him many friends. In 1787 he began teaching, and during this period (1787-1796), he produced many of his books.

As a master of satire, Richter gained a wide reputation, but his unlimited imagination and his emotional instability, brilliant as he was, made him a very unreliable writer, and one frequently difficult to understand. As a coiner of words, he is unsurpassed, adapting them marvelously to his purposes. At his best, his language is unsurpassed in German literature. To him the two outstanding facts of life were God and the immortality of the soul, and these colored much of his writing.

Representative Works. These include *Lavana*, *Extracts from the Devil's Papers*, *The Invisible Lodge*, *Hesperus*, and *Introduction to Aesthetics*.

RICKENBACKER, rik' en balik ur, EDWARD VERNON (1890-), popularly known as "Eddie," the most famous aviator of the American Expeditionary Forces in France in World War I. Before the war, he won national and international fame as an automobile



Photo: Brown Bros.

RICHTER

racing driver. General Pershing took him to France as a member of the motor-car staff in June, 1917, and two months later transferred him, at his own request, to the air service. After brief service as an engineer officer at a training field, Rickenbacker became commanding officer of the 94th Aero Pursuit Squadron, the first American airplane unit to get into active duty; this unit destroyed sixty-nine enemy planes—the largest number credited to any American squadron—and of the sixty-nine, Rickenbacker personally brought down twenty-six. He was decorated with the Distinguished Service Cross (American) with nine palms, the Croix de Guerre (French Cross of War) with four palms, and was made a member of the Legion of Honor (France). Later he received the Congressional Medal of Honor. He retired with the rank of major. Subsequently, he became affiliated with various automotive and air line organizations, and was made president of Eastern Air Lines in 1938.

As special consultant to Secretary of War Stimson, Rickenbacker made a tour to inspect United States air combat groups in various theaters of war in 1942. He completed the Atlantic tour of England, Ireland, and Iceland in early October and then embarked upon his Pacific trip. This included Hawaii, Australia, New Guinea, and Guadalcanal. With seven companions, he made a forced landing on the Pacific Ocean on October 21. After drifting for twenty-three days in a rubber lifeboat, he and six companions were rescued on November 12 by a navy plane. He recorded this experience in *Seven Came Through*. In 1943, the War Department sent him on a mission to Russia.

RICKETS, a disease of the bones most frequently found in children under three years of age. It is characterized by a rapid growth of the cartilaginous portion of young bones, but by little tendency to the regular change of cartilage into bone. The cartilage cells are not properly arranged, and little or no lime is deposited in the cartilage. In consequence, the soft bones bend into unnatural shapes, and unnatural knobs form. The most frequent deformities caused by rickets are bowlegs, knock knees, chicken breast, funnel chest, rosary ribs, and knobbed forehead. As the child grows older, the bones harden, but they are apt to retain the deformities. Rickets result from lack of exposure to sunlight, such lack preventing the body from building up enough Vitamin D, the principle which causes bones to grow properly. Young children should be exposed to sunlight for several hours daily to prevent rickets. When this is not possible, artificial light, cod-liver oil, and radiated foods may be used as substitutes to acquire enough Vitamin D. The symptoms of rickets are tendency to sweat, especially the head; weakness, flabbiness, pain in the bones, tenderness, and

distortion of the bones. The diagnosis is made by X-ray examination. See BONE; VITAMINS.

W.A.E.

RICKS COLLEGE. See IDAHO (Education).

RIDDLE, *rid'l*, a form of enigma, or puzzling question, to be solved by guessing or by conjecture; or a statement with a hidden meaning, which is to be discovered or guessed by the person or persons to whom it is addressed. The term has been extended to cover any proposition that is ambiguous, or anything puzzling, uncertain in its meaning, or intricate.

Guessing riddles is an ancient game and has always been popular, especially among the young. The earliest riddles were those propounded by oracles and bards, and were of a serious character. They were genuine enigmas, now sometimes called *sense-riddles*; but the riddling of ancient times has degenerated into less serious forms that may be described as conundrum puns. A *conundrum* is a kind of riddle based upon some fanciful resemblance between things that are quite unlike, forming a puzzling question the answer to which involves a pun, or play upon words. Riddles have been collected by students of language, and are studied as "fossils of folklore."

There are riddles in the Bible, and the story of Samson in *Judges* xiv is a good example. After Samson had slain a young lion with his bare hands and, returning later, found a swarm of bees and honey in the carcass, he propounded this riddle to the young men at his wedding feast in Timnath:

Out of the eater came forth meat,
And out of the strong came forth sweetness!

Puzzled, the young men cheated by worming the answer out of Samson's bride, a Philistine woman, and when they replied, "What is sweeter than honey, and what is stronger than a lion?" Samson knew they had cheated in the game, and took a terrible revenge.

Among the ancients, the sun, the moon, the rainbow, and especially the wind, were the objects of riddles. "What flies forever and rests never?" was a riddle referring to the wind. In Grecian mythology, we find the famous riddle of the Sphinx, "What animal goes on four legs in the morning, on two legs at noon, and on three legs in the evening?" When Oedipus guessed the answer, "Man," the Sphinx took it so much to heart that she killed herself, which under the circumstances was really a good riddance (see SPHINX).

Homer, the great Greek poet, is said to have died of vexation because he could not answer a riddle. Ancient Norse mythology mentions a riddle contest between Odin and a giant, in which the giant perished. They took their riddles seriously in those days. It was a game in which wagers were made, and the stakes might be life or honor. When you failed to

answer a riddle, it was no joke. It is said that there was a war of riddles between Lycerus, king of Babylon, and Nectanebo, king of Egypt, which was won by the former through the aid of Aesop, who was at his court.

In the eighth century, an archbishop of Canterbury is said to have written riddles, and by the Middle Ages riddling had become a popular pastime. From an old collection we get this example of the riddles of this era:

What is it that never was and never will be?
(A mouse's nest in a cat's ear.)

Not quite so old perhaps, but still hoary with age, is the familiar riddle of our childhood:

When is a door not a door?
(When it's ajar.)

Children on both sides of the Atlantic are familiar with the famous egg riddle, "Humpty Dumpty sat on a wall," and here is another long current in England:

Round as an apple, and flat as a pan;
The shape of a woman and the shape of a man!

The answer is "A penny," for the English penny has on one side the female figure of Britannia, and on the other the head of the reigning king.

For the children of to-day, there are riddles without number, most of them being of the conundrum variety. Following are a few examples of current riddles, beginning with one that is frequently heard among children at play:

Black and white and red all over! (A newspaper.)
What kind of fruit does the electric plant grow?
(Currents.)

A houseful, a hole full; you can't catch a bowlful!
(Smoke.)

Which side of a cat has the most fur? (The outside.)

Four eyes (I's) and can't see; no legs and can run!
(The Mississippi.)

Riddlecum, riddlecum, ruckup; what fell down and stuck up. (A fork.)

What would you do if you found a horse in your bathtub? (Pull out the plug.)

RIDDLE OF THE SPHINX. See SPHINX.

RIDEAU CANAL, a part of the Ottawa-Rideau system. See CANADA, page 1131.

RIDEAU FALLS. See OTTAWA, ONT.

RIDGWAY, 'rij' way, ROBERT (1850-1929), a leading American ornithologist, born at Mount Carmel, Ill. From his boyhood he showed a remarkably intelligent interest in natural history, and when but seventeen years of age, was zoölogist to the Clarence King geographical exploration of the fortieth parallel. In 1880 he became curator of the bird department in the National Museum at Washington, a post which he held until his death; and in 1883 he helped to found the American Ornithologists' Union, of which he later became president for two terms.

His Books. Ridgway wrote *A Nomenclature of Colors for Naturalists*, *Color Standards and Color Nomenclature*, *The Ornithology of Illinois*, *Manual of North American Birds*, and *The Birds of North and Middle America*, this last his chief work. It appeared in eight volumes, and ranks as one of the most important works on ornithology ever written.

RIDLEY, NICHOLAS (about 1500-1555), an English churchman, one of the early Protestant martyrs. He was graduated at Pembroke Hall, Cambridge, where Tyndale and others already had spread the new doctrines; later, he studied in Paris and at the University of Louvain. After his return to England, he attracted the attention of Archbishop Cranmer, who made him one of his chaplains, and later chaplain to Henry VIII. Ridley speedily became one of the leaders in the Protestant movement, and under Edward VI, acquired great influence.



Photo: Brown Bros.

NICHOLAS RIDLEY

In 1547 he was created bishop of Rochester, and in 1550 bishop of London; as a result of this promotion, he was appointed to assist in revising the English prayer book and in drawing up the Thirty-nine Articles. As an adherent of the Protestant side, he favored the claims of Lady Jane Grey to the throne, and as a consequence found himself in a dangerous position on the accession of the Catholic Mary. In 1553 he was arrested, in the next year was brought to trial with Latimer and Cranmer, in 1555 was found guilty of heresy, and was burned at the stake with Latimer.

Related Subjects. Ridley's life will be more fully explained, and the time in which he lived will be better understood, by reference in these volumes to the following articles:

Boleyn, Anne	Latimer, Hugh
Catharine of Aragon	Mary (I, England)
Cranmer, Thomas	Reformation, The
Cromwell, Thomas	Thirty-nine Articles
Henry (VIII, England)	Wolsey, Thomas

RIDPATH, JOHN CLARK (1841-1900), an American historian, born in Putnam County, Ind. He was graduated in 1863 from Asbury University, now De Pauw University, at Greencastle, Ind., was professor in Baker University, Baldwin City, Kan., for a time, and in 1869 was appointed to the chair of English in Asbury. He was later made vice-president of that institution, and it was chiefly through his efforts that the school secured an endowment of two million dollars and had its name changed to De Pauw University.

Representative Books. Ridpath wrote a number of historical works which are somewhat popular in style, but authoritative in content. His *Life of James A. Garfield and Life and Times of Gladstone* are worthy of mention, but his best-known work is the *History of the United States*, in eight volumes, which appeared in the year of his death.

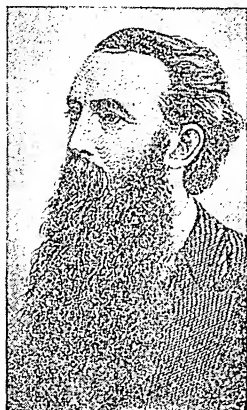


Photo: Brown Bros.

JOHN CLARK RIDPATH

RIEL, *reel* or *re' el*, LOUIS (1844-1885), a Canadian agitator, leader of two rebellions against the Dominion government. Riel voiced the protest of the half-breed and of all the great West against the entrance of civilization. He wanted to keep it as a frontier. A man of great personal magnetism, brilliant, eloquent, he is, nevertheless, a pathetic figure in Canadian history.

Riel was born at Saint Boniface, Man., the son of a white man and a half-breed woman. He is said to have been educated for the priesthood at Quebec, but it is certain that he did not take orders. Between 1866 and 1868, he worked at various occupations in Minnesota, but he was not conspicuous until 1869, when he led the Red River Rebellion. Riel was secretary, and one John Bruce was president, of a council elected by the *métis* (half-breeds) to insist on their rights, but Riel was the real head of the movement, and was later elected president of the "provisional government." When it was evident that the rebellion was a failure, he fled to the United States, where he remained for several years. In 1873, and again in 1874, he was elected to the House of Commons as member for Provencher. In the latter year, although there was a reward of \$5,000 still standing for his capture, he actually attempted to take his seat. The Commons, however, expelled him, and in February, 1875, he was declared an outlaw.

For the next nine years, Riel kept out of the public eye. In 1877 he was held for a time in an insane asylum in Quebec, but soon he was at large again, and there is some evidence that he was negotiating with the Fenians to lead an invasion of the Northwest. He subsequently lived in Montana for five years, and from there was called by the French half-breeds, who had moved westward and were living on the Saskatchewan River, to help them win certain demands from the government. Here again, in March, 1885, Riel was elected president of a short-lived provisional government with headquarters at Saint Laurent. On the col-

lapse of the movement, he was captured, tried for high treason, and hanged November 16, 1885. See SASKATCHEWAN REBELLION; RED RIVER REBELLION. G.H.L.

RIENZI, *rih en' ze*, COLA DI (about 1313-1354). The story of Rienzi is the story of a tavern-keeper's son who became a famous tribune of the people of Rome. He was born in Rome, and received an education which filled his mind with tales of the ancient glory and splendor of that city. This had a strong effect on him, and his desire to free the city from oppression at the hands of its aristocratic governors was intensified by his wish to avenge the death of his brother, who had been slain by a noble. The rulers of the city hated and feared him, but the Pope gave him his support, and by 1347 Rienzi was strong enough to call a meeting of the people on the Capitol and propose the adoption of a new form of government. Accompanied by the Papal legate and surrounded by a hundred horsemen, Rienzi delivered a stirring discourse. As a result, new laws were drawn up and Rienzi was made tribune (which see), with practically unlimited power, while the nobles left the city, with no attempt at opposition.

At first he ruled justly, if sternly, and widespread approval of his acts was expressed; but his absurd ceremonials, together with his increasingly autocratic assumption of power, brought ridicule upon him and destroyed popular confidence in his sincerity. At the end of 1347, after a reign of only seven months, with the Papal authority now ranged against him, he lost heart and fled to Naples.

For two years he lived in a monastery among the mountains of the Abruzzi, and then sought to induce Emperor Charles IV to take up the work of delivering Rome from the power of the nobles. Charles refused Rienzi's request, put him in prison, and a year later gave him up to Pope Clement, who kept him imprisoned at Avignon. When Innocent VI became Pope in 1352, he released his prisoner and sent him on a mission to Rome. The people received him with enthusiasm, and he was able within a few days to regain his lost power; but cruel and arbitrary acts on his part enraged the populace, and in October, 1354, a disturbance arose, during which he was killed.

In Literature. Bulwer-Lytton's *The Last of the Tribunes* deals with Rienzi's life, as does Wagner's opera *Rienzi*.

RIESENGBIRGE, *re zen geh beer' geh*, a range forming the middle and highest part of the Sudetic Mountains in Europe, dividing Lower Silesia from Bohemia. The Riesengebirge, whose name means *giant range*, are formed chiefly of granite, porphyry, mica schist, and gneiss, and contain beds of coal, basalt, and other minerals. The highest point is the

Schneekoppe (Snow Peak), which is 5,265 feet above the sea. The whole range is covered with pine trees and is ruggedly beautiful. See GERMANY (Surface).

RIETSCHEL, *re' chel*, ERNST (1804-1861), a German sculptor who "produced with imperishable power, in monumental form, the intellectual and moral ideals of the nation, in the persons of their noblest representatives." He was born at Pulsnitz, Saxony, studied art at the Dresden Academy, and later became a pupil of Christian Rauch (which see). He was appointed professor at the Dresden Academy in 1832, after a trip to Italy, and held this post until his death. His statue of *King Frederick Augustus of Saxony* was finished when he was about twenty-seven years old. Rietschel's best character

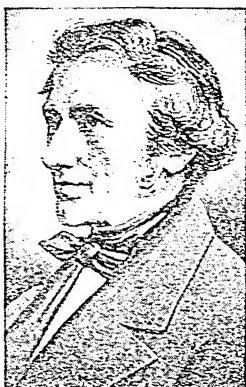


Photo: Brown Bros.

RIETSCHEL

portrayal is shown in the statues of *Lessing* at Brunswick, *Luther* at Worms, and the magnificent *Goethe-Schiller Monument* at Weimar. His execution of the figure of *Weber* at Dresden is superb, because of its delicate simplicity. His deep religious feeling is manifested in *The Christmas Angel*, a beautiful relief widely known through reproduction.

RIFF, *THE*, OR ER RIF, a mountainous area on the north coast of Morocco, extending along the Mediterranean for about 180 miles. The hills are a part of the Atlas Range, and reach an altitude of 7,000 feet, with a mean elevation of about 2,000 feet. The inhabitants, who are Berbers, and of a warlike nature, are chronically in revolt against the sultan's government. Formerly, piracy was a favorite occupation, and their entire history reveals treachery and lawlessness, while their constant tribal uprisings have been the woe of Spain and France for many years. Through the history of Spain we may trace an ever-increasing desire for more elbow room in Morocco, and we may look to the Rifians as the main obstacle to this ambition, for they resisted alien invaders for over two thousand years, and yielded only when attacked from two sides by two powerful European countries.

The Rifians are Mohammedans and are divided into clans and tribes; they are sober and deeply religious, and according to the Moslem view, moral. Their former chief, Abd-el-Krim, was educated at the University of Madrid, and gained military training in the armies of Spain. He came to despise the

Spaniards, and on returning to his native land, determined to arouse a nationalistic spirit in his fellow tribesmen and develop a military power sufficient to drive the hated Spaniard from that corner of the world. This accomplished, he would set himself up as ruler of an independent kingdom.

In the spring of 1925, after a year or more of guerrilla warfare, in which Spanish regiments failed to give a good account of themselves, the Rifians, augmented by many tribes drawn to the cause by the seeming success of Abd-el-Krim, attacked the power of Spain in earnest. The Spanish were driven to the coast within a few months, and they abruptly decided to abandon their efforts to capture Abd-el-Krim. Had it not been for the French, who were active in the territory south of the Rif, Abd-el-Krim would probably have been successful. However, the French, fearing victory would whet the zeal of the tribes for further conquests, planned a brief Moroccan campaign calculated to curb this desire. France soon discovered that its adversaries possessed military ability of no mean order, and generals who were heroes of critical battles of the World War were sent to head the French troops and capture and punish Krim. France, too, nearly failed; for the Rifian leader displayed generalship and strategy that promised to defeat the enemy, when Spain returned with fresh troops.

Held as in a vise between the fire of the French from the south and the Spaniards from the north, the end seemed inevitable to the rebels, but the resourceful Rifians continued the unequal struggle. In April, 1926, Abd-el-Krim realized that he could not continue against such great odds, and decided to surrender while he might still exact good terms. The surrender required the Rifians to submit to the sultan of Morocco. They refused to accept the term "submission," but agreed to "recognize the spiritual and temporal authority of the sultan." Spain desired the life of Abd-el-Krim, but France protected him; accordingly, he was exiled to the Isle de Reunion, and was permitted to take four of his wives and a large retinue. A pension provided by two governments he resisted will maintain him in comfort the remainder of his life. See MOROCCO.

RIFLE, a firearm designed to be carried and manipulated by one man, which serves as an offensive and defensive weapon in war, and an instrument of sport. It is so called from the helical grooving, or "rifling," in the barrel, which imparts a rotary motion to the bullet and insures greater accuracy of fire. The first rifles were used by the hunter and for amusement, and until the beginning of the twentieth century, the hunter's rifle was superior to the military rifle. Authorities differ as to the inventor of rifling, and while some point to a

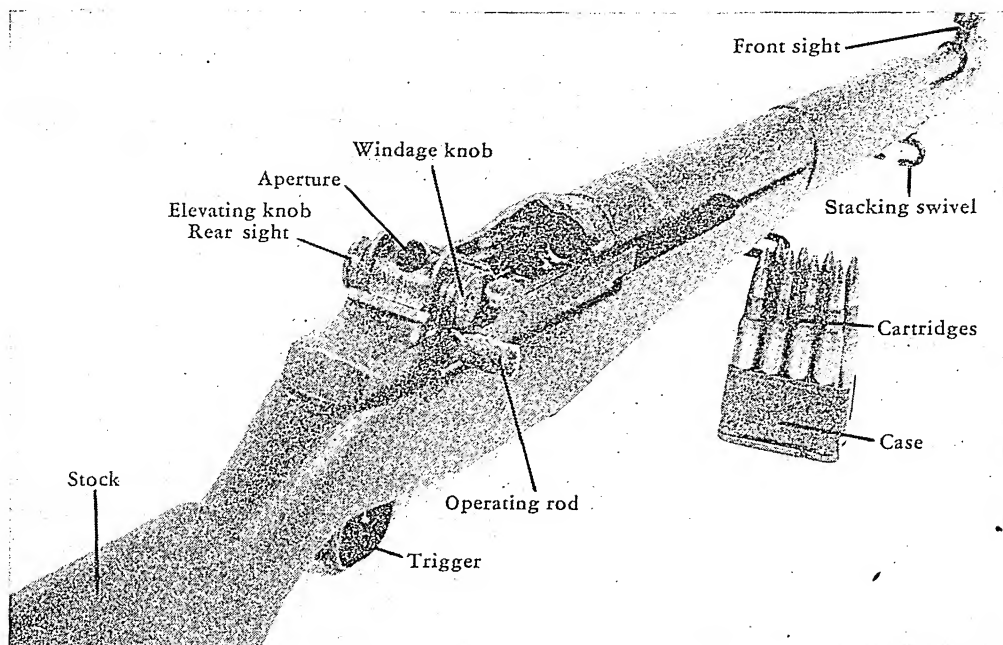


Photo: U. S. Army Signal Corps

MECHANISM OF A MODERN RIFLE

record dated 1476, showing the invention of a weapon with a helically grooved barrel, others say that the device was invented about 1520 by Gaspard Koller of Vienna.

The rifle used by the early American colonists was an improvement on their musket, the Brown Bess, which was accurate only to about sixty yards. For hunting purposes, this early rifle could be depended upon for 150 yards, and constant improvement in the gun as well as the ammunition has increased the effective range of rifles to considerably over a mile.

The value of rifles was demonstrated in the Revolutionary War in America. The first American rifles were made by the Swiss colonists. In 1851 appeared the first rifle firing an elongated bullet, instead of a round metal ball. It was called the *Minie*, after its inventor of that name, who was awarded \$100,000 for his invention by the French government. The *Minie* rifle, with a bayonet attached, was used in the Crimean War (1854). It fired a charge of $2\frac{1}{2}$ drams of powder, and was sighted for 100 to 1,000 yards.

Between 1857 and 1861, Sharp's, Green's, Westley-Richards' and Terry's breech-loading guns were introduced. Sharp and Spencer carbines and rifles were used by the Federal troops in the War of Secession, but the universal adoption of the breech-loading rifle dates from 1867.

Then came the introduction of the magazine principle, to insure quicker firing. The Winchester was one of the earliest magazine rifles, and was used with great effect in the Russo-

Turkish War of 1877. In the Winchester rifle, the cartridges were loaded into a tube under the barrel, and were forced into the chamber by the action of a lever which opened and closed the breech. The introduction of smokeless powder in the last part of the nineteenth century was an enormous advantage to rifles and increased their use. The magazine principle is embodied in the rifles used by all modern armies.

The United States army, up to 1904, was armed with the Krag-Jørgensen, which was then superseded by the Springfield rifle. The Springfield rifle barrel has four grooves and a caliber of 0.30; the rifling in the barrel makes one turn in ten inches of barrel length. A charge of fifty grains of smokeless powder is fired. The bullet is jacketed with gilding metal, covering a core of lead, and weighing 150 grains. These are effective at 3,000 yards, but accurate shooting cannot be obtained at that range. The Springfield magazine is below the breech mechanism, and is loaded with five cartridges from a metal clip. Between the magazine and the breech is a "cut-off," or piece of metal which closes the magazine and allows the rifle to be used as a single-firer, loaded by hand at the breech. This makes it possible to keep a full magazine ready for immediate use when quick fire is essential. The rifles used by European armies are patterned on the same principles as the Springfield.

By 1900 most of the improvements on rifles had been made, and types used by the armies of the various countries were of about the same

efficiency. All weighed about eight or nine pounds without their bayonets, were between forty-nine and fifty-two inches long, with caliber of .315, .311, .303, or .276, and sighted for over 2,000 yards. When World War I began, the rifles were dated from patterns of the years 1886 to 1907, and with a few improvements, these were the models used throughout the war. The following are the distinctive types: Great Britain, Short Lee-Enfield; Germany, Mauser; former Austria, Mannlicher; France, Lebel; Norway and Denmark, Krag-Jørgensen; Russia, Three Line Nagant; and the United States, Springfield. In 1917 a new Enfield was designed and manufactured for American troops; however, the Springfield and Krag-Jørgensen continued to be used, and the United States ammunition was more effective than the British, because of its higher velocity.

When tanks began to appear in the World War I, an anti-tank rifle was introduced, but it was too heavy a weapon to be fired from the shoulder or managed by one soldier. The trench warfare brought in the light machine gun adaptable for mobility and firing power, and this weapon more or less displaced the rifle.

Rifles have been made semiautomatic. The most successful of these was developed after years of research by John C. Garand, an employee in the Ordnance Department of the Springfield Armory. The Garand rifle was officially accepted by the United States Army as a standard weapon in 1936. Known as U.S. Rifle Caliber .30 M 1, it is gas-operated, self-loading, and slightly over nine pounds in weight. With this rifle, the average rifleman can fire about forty shots per minute. This high record results from the fact that (1) the kick of the rifle is very light, and (2) it can easily be kept steadily on the target throughout successive shots.

In the rifles used for sport—hunting and target practice—the size and power of the rifle are determined by the type of game. For target practice and small rodents, a .22 caliber short cartridge is used, and for animals a little larger, such as rabbits and squirrels, a .22-long is sufficient. For the big game, such as moose, elk, and large bears, a more powerful rifle, namely a .405 Winchester, is best. Target practice is a fascinating sport requiring a good eye and steady nerves. It has become popular with women as well as men.

Related Subjects. The reader is referred to lists of articles given at end of the article ARMY; ENFIELD RIFLE; GARAND RIFLE; MACHINE GUN.

RIGA, *re' gah*, the capital of Latvia (which see).

RIGA, OR **LIVONIA**, **GULF OF**, an inlet on the east side of the Baltic Sea, about 100 miles long from north to south, and seventy miles wide (see physical map in the article EUROPE). The gulf forms the shore line of Courland,

Livonia, and Estonia. On account of its salinity, it never entirely freezes over, in spite of its shallowness. Along the coast the waters are navigable for nine months of the year. The Dvina, on which the city of Riga is situated, is the largest river opening into the gulf.

RIGDON, **SIDNEY**. See **MORMONS** (History of the Mormon Church).

RIGEL, *ri' jel*, seventh among the stars in brightness. See **ASTRONOMY** (The Stars and Their Names).

RIGGS, **KATE DOUGLAS WIGGIN** (1859-1923), an American novelist and writer of juvenile fiction, was born in Philadelphia, Pa.



Photo: U & U

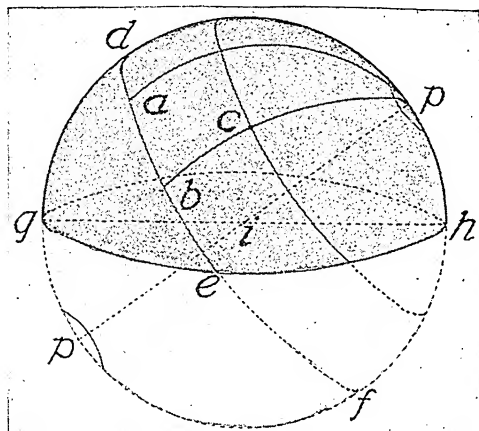
MRS. RIGGS

She was educated at Abbot Academy, Andover, Mass., and at the age of eighteen went to Los Angeles, Calif., to teach. In 1878 she founded at San Francisco the first free kindergarten on the Pacific coast, and two years later established in that city the California Kindergarten Training School. As Kate Douglas Smith, she married S. B. Wiggin, a California lawyer, in 1880. Six years after his death, which occurred in 1889, she married George C. Riggs. She died suddenly while in England.

Literary Career. The author's first story, *The Birds' Christmas Carol*, still remains one of the most popular books for children, though published in 1888. It was followed by several other juvenile tales, notably *Timothy's Quest*. In 1902 she began a series about children, but written for more mature readers, including such delightful stories as *The Diary of a Goose Girl*, *Rebecca of Sunnybrook Farm*, *Rose o' the River*, *New Chronicles of Rebecca*, and *Mother Carey's Chickens*. These books are classics of their kind. Later publications included *Bluebeard*, a musical fantasy; *Penelope's Postscripts*, *Ladies-in-Waiting*, and *Homespun Tales*.

RIGHT ASCENSION AND DECLINATION OF STARS. As the position of places on the earth is described by the terms *longitude* and *latitude*, so is the position of heavenly bodies defined by the terms *right ascension* and *declination*. It must be remembered, however, that the position of heavenly bodies is stated with reference to the *celestial equator*. On the earth, Greenwich is the starting point of measurement of longitude. In the heavens, the point of reference is the "first of Aries," or the vernal equinox. Thus the right ascension of a star is ascertained by drawing an imaginary great circle from the celestial pole through that star to the celestial equator. The meas-

urement of the arc of the equator, from the first of Aries, or vernal equinox, to the point on the equator where the great circle crosses, is the right ascension of the star (*a b* in dia-



(*a*) Vernal equinox; (*b*) point at which great circle from pole through star meets the equator; (*c*) position of star; (*d, e, f*) celestial equator; (*g, h*) horizon of person standing at (*i*).

gram). The *declination* is the distance north or south of the celestial equator measured on the arc of the imaginary great circle from the equator to the star (*b c* in diagram).

RIGHT BANK OF A RIVER. See **RIVER.**

RIGHT OF ASYLUM. See **ASYLUM.**

RIGHT OF EMINENT DOMAIN. See **EMINENT DOMAIN.**

RIGHT OF POSSESSION. See **TITLE.**

RIGHT OF SANCTUARY. See **ASYLUM.**

RIGHT OF SEARCH. See **SEARCH, RIGHT OF.**

RIGHT OF WAY. See **EASEMENT.**

RIGHTS, BILL OF. See **BILL OF RIGHTS.**

RIGOLETTO, *re go let' to*. See **OPERA** (Some of the Famous Operas).

RIGSDAG, *rigz' dahg*, the legislative body of Denmark. See **DENMARK** (Government).

RIIS, *rees*, **JACOB AUGUST** (1849-1914), an American journalist, author, and social worker, called by Theodore Roosevelt "America's most useful citizen," was born at Ribe, Denmark. At the age of twenty-one, he emigrated to America, where for six years he was glad to get various employments, such as construction camp work, carpentry, coal-mining, farm work, and peddling. In 1877, after suffering from actual poverty, Riis became a reporter for the *New York Tribune*, then police reporter for the *Sun*, and in this capacity, he gained a familiarity with conditions in the city's poorer section. He became a practical social reformer, a leader in movements for securing greater purity in the city water supply, parks in the congested districts of lower New York, and well-equipped playgrounds for poor children.

Riis's friendship and sympathy were particularly extended toward the immigrants of the lower classes. He was executive officer of the Good Government Club and became secretary of the New York Small Parks Commission in 1897. After serving as reporter for twenty-seven years on various New York papers, he resigned and devoted his time to lecturing and writing. At the time of his death, he was generally recognized as one of the foremost social workers of America.

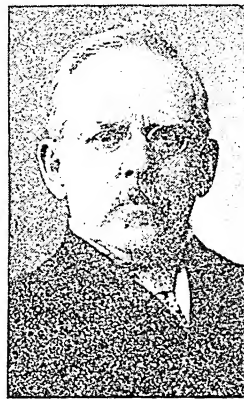


Photo: Brown Bros.

JACOB RIIS

His Books. Among his writings are *How the Other*

Half Lives, a book for which he was at first unable to find a publisher; *The Children of the Poor*; *The Making of an American* (his autobiography); *The Battle with the Slum*; *Children of the Tenements*; *Theodore Roosevelt, the Citizen*; *The Old Town*; and *Hero Tales of the Far North*.

RIKSRET. See **NORWAY** (Government).

RILEY, JAMES WHITCOMB (1840 [?] - 1916), American poet who is known as the evangel of the common things of life, and whose title, given in affection, is

"Hoosier Poet." He was born in Greenfield, Ind., October 7. Since his father's profession, the law, did not appeal to him, after receiving a common-school education, he worked for a time as a sign painter and then became a traveling actor. His spare hours he spent in composing songs and revising plays for the show company, and in gaining an intimate knowledge of the country folk of Indiana, their dialect and their peculiarities, of which he later made good use. Becoming a reporter for the *Indianapolis Journal*, in 1873, he began to contribute poems to that paper and others, signing them "Benjamin F. Johnson, of Boone." His dialect verses soon became very popular, and the "Hoosier Poet" won a wide reputation. In 1877, by a clever literary hoax, he deceived editors and readers all over the country. He published in the *Kokomo*



JAMES WHITCOMB RILEY

One of the best loved and most widely read poets of his generation. The illustration shows him in middle life.

He published in the *Kokomo*



Surrounded by Idolizing Friends. James Whitcomb Riley, poet of childhood, in a familiar scene on Lockerbie Street; his home was a Mecca for boys and girls of the neighborhood.

Dispatch a poem called *Leonainie*, which he signed "E. A. P.," and which a statement of the editor's declared to be a newly discovered poem by Poe. Even critics were interested, and not until the *Dispatch* itself explained the joke was the deception known.

For a time, with Edgar W. (Bill) Nye, Riley traveled about the country lecturing and reading from his poems, and his wonderful power of mimicry made him very successful in this form of entertainment.

The site of the Indianapolis Public Library was donated to the city by Riley, and the Indiana Children's Hospital was named Riley Hospital in his honor. His former home, in Lockerbie Street, is maintained as a memorial and is visited by thousands of persons yearly. His birthday is celebrated in the public schools of Indiana by appropriate exercises.

His Writings. The pathos and humor of his simple poems of Indiana life have made their appeal very general. Few present-day poets have been so widely read. Although he wrote some beautiful selections in pure English, his most popular works have been in the Indiana dialect.

His first collection, *The Old Swimmin' Hole and 'Leven More Poems* (1883), was followed by many other books of verse, including such favorites as *Out to Old Aunt Mary's*; *When the Frost is on the Punkin* and other Poems; and *Knee-Deep in June*.

RIMINI, *re' me ne*, GIACOMO, a baritone and actor of ability, member of the Chicago Civic Opera company until it closed in 1932. He was born at Verona, Italy, and made his professional debut in that city. Before joining the Chicago company, he achieved notable success in numerous cities of Italy, and later was a favorite with South American audiences. Included in the lengthy list of operas in which he has appeared are *Falstaff*, *Otello*, *Aida*, *Rigoletto*, *La Bohème*, *Jewels of the Madonna*, *Tannhäuser*, *Les Huguenots*, and *Rosenkavalier*. Rosa Raisa (which see) is his wife.

RIMSKY-KORSAKOV, NIKOLAI ANDREYEVICH (1844-1908), Russian composer, was born at Tikhvin, Government of Novgorod. He attended the naval college at Saint Petersburg from 1856 to 1862, and then was sent on a three-year cruise. Meanwhile, he had begun his serious study of music. Balakirev became his tutor in 1861. Ten years later, he was appointed professor of composition at the Saint Petersburg Conservatory. He was conductor of the Free School Concerts from 1874 to 1881, and of the Russian Symphony Concerts from 1886 to 1900. One of the most famous of the modern school of Russian composers, many of his works are distinctly Slavonic. Among his compositions are fifteen operas, including *Snow Maiden*, *Sadko*, and the *Golden Cockerel*; numerous orchestral works; choral numbers; chamber music; and many songs.

RINDERPEST, *rin' dur pest*, OR CATTLE PLAGUE, a highly contagious, acute disease

of cattle and other members of the ox family. It is the most serious plague of animals. The disease hindered the development of Western civilization for many centuries. It swept over Europe from the East with every war. It brought about the founding of veterinary colleges in the last half of the eighteenth century. The last European outbreak occurred in Belgium following the World War. It never existed in the United States, and is now confined to Oriental countries. One of the first steps taken when the Americans occupied the Philippines was the eradication of rinderpest by extensive vaccination and sanitary measures.

Suddenly arrested milk secretion in the cows, fever, prostration, and ulcerations of the mouth are the outward symptoms.

The cause is an elusive, invisible virus. Natural infection is made by direct contact or carriers. Death usually occurs in 4 to 7 days; morbidity is 60 to 70 per cent; mortality as high as 98 per cent. Treatment must be recommended by a veterinarian.

L.A.M.

RINEHART, MARY ROBERTS (1876-), an American story-writer whose works are characterized by humor, insight into character, and interesting plots. She was born in Pittsburgh, Pa., educated in the grade and high schools of that city, and at the training school for nurses. In 1896 she married Dr. Stanley M. Rinehart, who died in 1932. Mrs. Rinehart took an active part in the suffragist movement, and during the World War served the American Red Cross in Europe.



Photo: U & U

MRS. RINEHART

As a Writer. Mrs. Rinehart's early novels were mystery stories, among them being *The Window at the White Cat*, *The Man in Lower Ten*, and *The Circular Staircase*. Later stories, though often pervaded by an element of mystery, more nearly approach the character novel in type. These include the ever-popular "Tish" stories, the "Bab" series, *The Street of Seven Stars*, *K, Long Live the King*, *The Amazing Interlude*, *Dangerous Days*, *A Poor Wise Man*, *Twenty-Three and One-Half Hours' Leave*, *The Breaking Point*, *The Out Trail*, *The Red Lamp*, *Nomad's Land*, *Lost Ecstasy*, *This Strange Adventure*, *The Romantics*, *My Story*, and *Miss Pinkerton*. She has written for the stage, and several of her novels have been dramatized or adapted for moving-pictures. Of her plays, the most successful was *The Bal*, written in collaboration with Avery Hopwood.

RING, a band of gold or other precious metal, usually worn on the finger. Primitive peoples have worn rings suspended from the nose or lips, and upon the arms, neck, legs,

and toes. The earliest rings known are those found in the tombs of ancient Egypt, though it is certain that the wearing of rings is as old as human history. The custom grew out of a love of ornamentation, but gradually took on

a vein runs directly from that finger to the heart, and heart and hand are offered together. In some countries, both husband and wife wear a wedding ring.

In addition to an ornament, a ring has always been regarded as a symbol of authority, confidence, and love, and still plays an important part in the coronation of kings and in the consecration of bishops. Among uncivilized people, such as many tribes in Africa and the islands of the Southern Ocean, rings still adorn noses, ears, arms, ankles, and toes, but civilized nations encourage the wearing of rings only on the fingers and in the ears, though earrings are unfashionable at times.

Until the fourteenth century, thumb rings were commonly worn, and Falstaff boasted that, although he was enormously fat, he could in his youth "creep into an alderman's thumb ring." Of precious stones used in ring settings, the diamond is the most popular, but the amethyst, turquoise, topaz, pearl, emerald, ruby, and sapphire are also extensively worn.

The ring of the Pope is of especial interest. It is presented to him at his coronation by the city of Rome, and bears his name and a picture of Saint Peter in a boat. It is sometimes called the "fisherman's ring." Every official decree of the Pope must be signed with this signet. When the Pope dies, his ring is broken, and a new one is prepared for his successor. The Papal ring, shown at the left, is not the type worn by the Pope, but is an example of the huge thumb rings given by the Popes to newly appointed cardinals.

RINGGHIT, MOUNT. See JAVA.

RINGSTONE. See ARCH.

RINGWORM, *ring' worm*, a general name for several forms of skin disease caused by minute vegetable organisms, or fungi. Itching may or may not be a symptom. Common ringworm of the skin, often seen on children, begins as a small red area the size of a split pea. As this grows larger, sometimes reaching the size of a silver dollar, the inside clears, and the eruption appears as a red, scaly ring. There may be one or several patches. This form of ringworm occurs on the non-hairy parts of the body, is contagious, but is easily cured. If the spots are painted every two or three days with iodine or mercury preparations advised by a physician, they will disappear. Often they disappear without treatment after a few weeks, but may persist for months. Body ringworm, which may attack persons of any age, consists of flat yellowish or brownish patches of varying sizes. It appears on the neck, back, chest, and abdomen.

Ringworm of the hands and feet is another common ailment, and has three types. A white sodden area between the toes, especially the part adjacent to the little toe, is evidence of *interdigital* ringworm. It may not cause



OLD FORMS OF RINGS

- (1) Ancient Egyptian ring
- (2) Gold ring from Mycenae
- (3) Egyptian signet ring
- (4) Roman gilded bronze ring
- (5) Grecian gold ring
- (6) Gold signet of a Brahman
- (7) Anglo-Saxon betrothal ring
- (8) Jewish marriage ring
- (9) Papal ring, fifteenth century
- (10) Betrothal ring, seventeenth century
- (11) Wedding rings of Luther and Katharina
- (12) Merovingian ring

a more significant aspect. Kings passed their rings to trusted servants, that they might have the full authority of the king himself. The signet ring with some distinctive device took the place of the purely ornamental ring. Pharaoh placed his signet ring on Joseph's finger when he set him over all Egypt, that all men might know that he held full kingly power (*Genesis* xli, 42). The use of betrothal or engagement and wedding rings originated with the Jews. The wedding ring is worn on the third finger of the left hand, because it was once popularly, but erroneously, supposed that

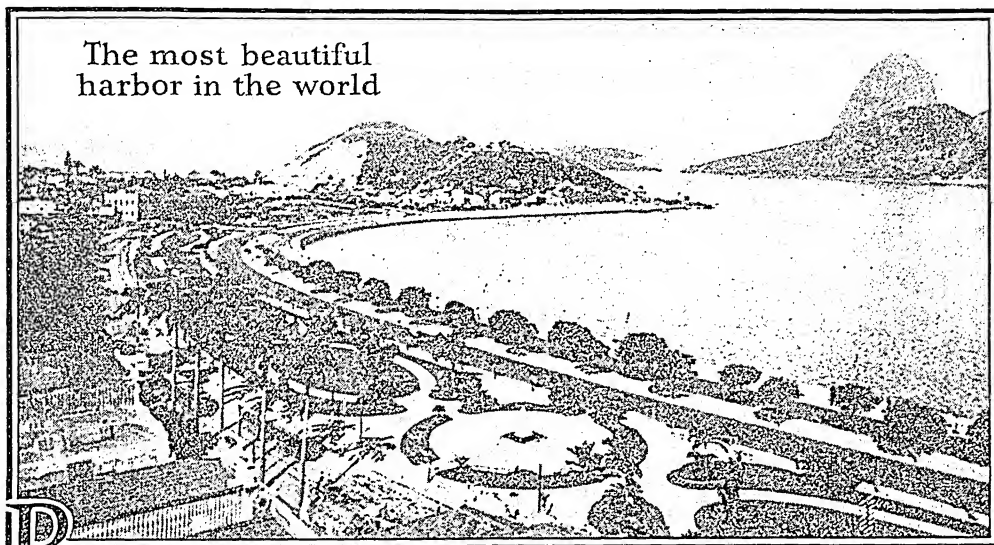
discomfort, but is sometimes followed by the *vesicular* form, which gives rise to eruptions of blisters on the hands and feet. Less common but more persistent than these forms is *keratotic* ringworm, usually limited to the palms and soles. The affected areas are very dry, slightly thickened, and slightly reddened. X-ray treatment may be necessary in severe cases.

There is also ringworm of the hairy parts of the body. Children are especially susceptible to ringworm of the scalp, which they some-

times contract from other children or from dogs and cats. The most severe form causes permanent loss of hair. Usually local treatment is successful, but X-ray treatment may be required in some cases. A ringworm of the bearded part of the face is called *barber's itch*.

When ringworm appears in a family, each affected person should exercise every precaution, using his own comb, towels, wash cloths, and other personal articles. The disease is highly infectious. See ITCH; PARASITE; PARASITIC DISEASES. W.W.B.

The most beautiful harbor in the world



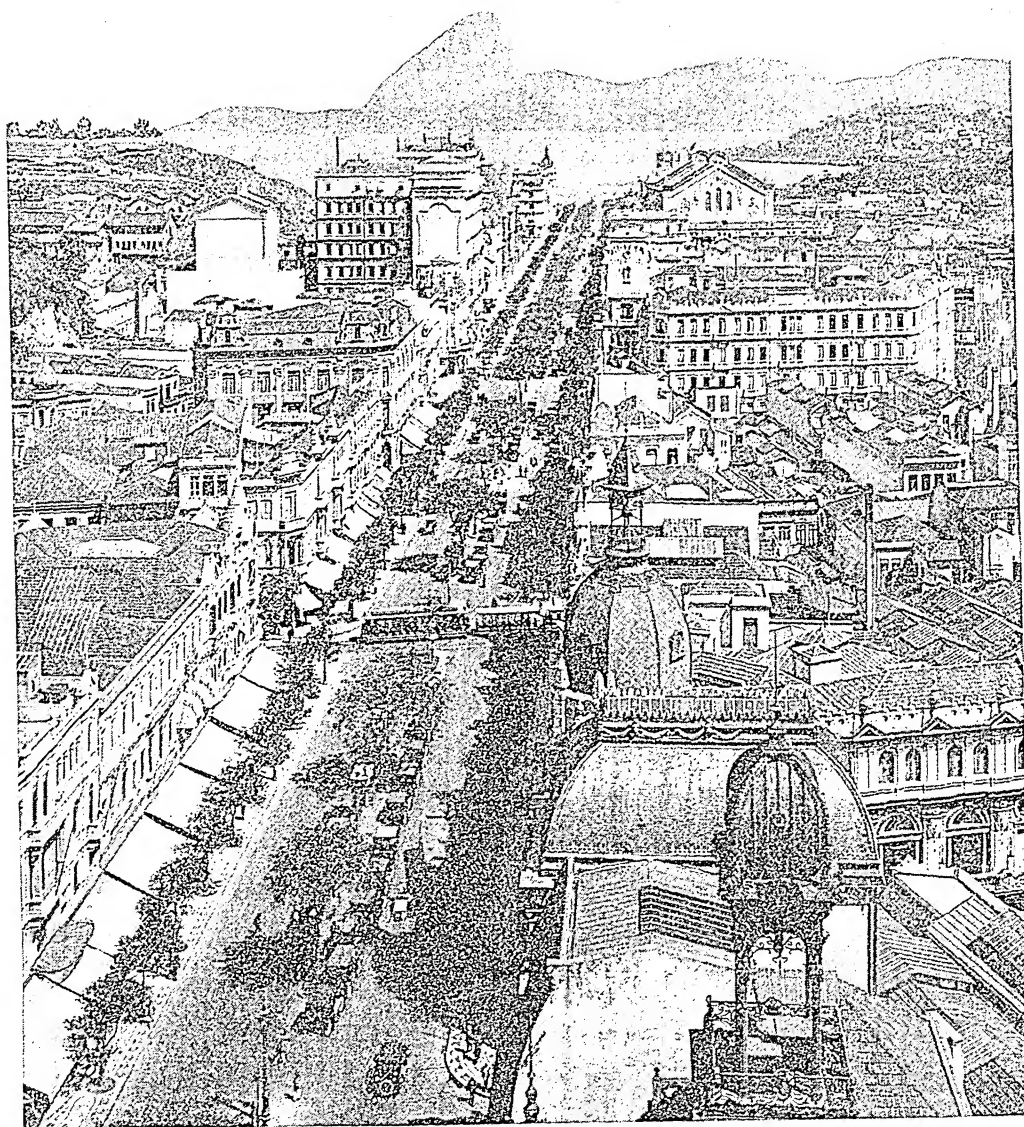
RIO DE JANEIRO, *re' o day zhah na'-ro*. Situated on the most beautiful harbor in the world, this capital and metropolis of Brazil has the charm of a Continental city mingled with the spirit of modern progress and efficiency. Its population of 1,711,466 (1936 estimate) ranks it as the second South American city, Buenos Aires having about seven hundred thousand more inhabitants. Rio de Janeiro is 5,204 miles from London, 4,748 miles from New York, and 5,160 miles from New Orleans. From 1834 to 1937, the city, with its suburbs, formed a Federal district, detached from the state of Rio de Janeiro. Nictheroy, across the harbor, is the capital of the state (see BRAZIL [Cities]).

Brazil's great capital is situated on the west side of the Bay of Rio de Janeiro, which, stretching inland for several miles and studded with islands and surrounded by mountains, is accounted the most magnificent harbor in the world. The city owes much of its beauty to the fact that it is built on the flat land and low, wooded hills between the mountains, the spurs of which project in some places almost to the margin of the bay and form picturesque valleys within the city limits. The residence

quarters of the city follow some of these valleys up the sides of the mountains, and in other places the poorer residents have built their dwellings on the steep slopes.

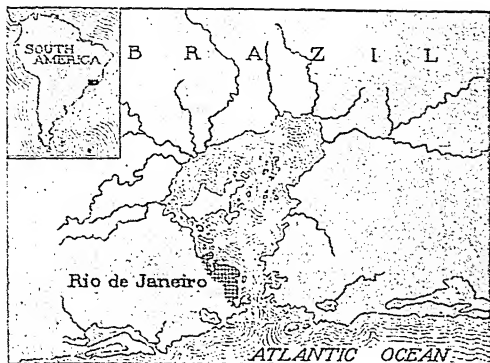
Until the latter part of the nineteenth century, Rio de Janeiro was a typical Latin-American city, a picturesque Old World sort of place which had its daily paper, founded in 1808, its National Museum, and its botanical garden, and enjoyed an enormous export trade in coffee. Then it was a city with narrow streets, poorly built wharves, and a harbor that was filling up with silt, so that no large ships were able to dock. Up to the beginning of the twentieth century, the town was dirty and disease-ridden. Today, while retaining all of its old beauty and charm, it is an almost perfect example of the ideal modern city, with beautiful public buildings and private residences, clean asphalt streets, palm-bordered boulevards, good sanitation, pure water, and a good health record.

The Mangue Canal, a waterway originally built for connecting the bay with a great city market, has been enclosed with stone walls and bordered with great royal palm trees, and is now part of a public pleasure ground.



A Splendid Avenue. Avenida Rio Branco, the principal down-town thoroughfare of the city of Rio de Janeiro. The Sugar Loaf is seen in the distance, towering 1,212 feet above the waters of the bay.

There are many public parks and gardens, for, as in most Portuguese cities, the principal buildings are grouped around squares. The most famous of the parks is the Botanical Garden, founded in 1808, noted for its rare plants from all over the world and for its avenue of royal palms. These trees are not



LOCATION OF RIO DE JANEIRO

The rectangular black spot in the corner map shows the area included in the larger map.

native to Brazil, but were imported originally from the West Indies. Above the Garden, on the peak of Corcovado, there is a colossal statue of Christ, standing with arms outstretched. Illuminated by floodlights at night, it appears as a symbol of protection for the city.

Many of the public buildings, both the old and the new, are magnificent. One of the most notable is the National Museum, once the residence of the Emperor Dom Pedro II. It now contains the most valuable collection of books in South America. Others include the splendid Palace of Justice, the headquarters of the Ministry of Public Industry and Public Works; the Cattete Palace, the official residence of the President of the republic; the Itamaraty Palace, which is now occupied by the Ministry of Foreign Affairs; and the Municipal Theater, which ranks with the world's greatest theaters. Another interesting feature of the city is the aerial trolley which connects Sugar Loaf, a mountain peak at the entrance of the bay, with the main part of the city.

A magnificent bayside boulevard, the Avenida Beira Mar, curves around the water front; its paved walk, paralleling the boulevard, is embedded with mosaic and is washed every night. Near the common starting point of the main avenue, the Avenida Rio Branco, and the bayside boulevard is the imposing Monroe Palace, named in honor of the American President who promulgated the Monroe Doctrine. See illustration, page 930.

The Roman Catholic religion is the faith of the majority of the inhabitants. The city has the University of Brazil (founded in 1920),

and elementary education is being given more attention than in former years.

About the year 1900, Rio de Janeiro began to realize that its position as the shipping port for the richest, most productive, and most thickly settled region of Brazil depended on extensive harbor improvements. These have been completed at a cost of millions of dollars. The entrance to the harbor is open to the largest vessels, and inside there is room for all the navies of the world. The water front is lined with walls of solid masonry. Deep-water quays, which are great piers of concrete and stone, have been built, beside which the largest boats can moor. Both hydraulic and electric power are available for loading and unloading, and railways connect the quays with the shipping and warehouse districts. Besides the enormous coffee output, the city's exports include sugar and tapioca, tobacco and cigars, meat and hides from the great cattle plains of the south and west, and cabinet woods from the forests.

RIO DE LA PLATA, *re' o day lah plah' tah*, the estuary, or funnel-shaped bay, formed by the Parana and the Uruguay rivers on the southeastern coast of South America. It extends northwestward from the sea for about 170 miles. A great volume of water flows into it from these two rivers, creating a powerful current, and there are many treacherous shallows; navigation is therefore hazardous all along its course. Not far from the mouth, which is 143 miles wide, lies the natural harbor of Montevideo, Uruguay, while on the Argentine side, at Buenos Aires and La Plata, massive docks have been built and deep channels dredged. The estuary was discovered by Diaz de Solis in 1516, but was given its present name, which means *silver river*, by Sebastian Cabot.

RIO DE ORO, a Spanish colony in Northwestern Africa, bordering the Atlantic Ocean on the west and reaching the Sahara Desert on the east. Its greatest length is from the boundary of Morocco southward; the estimated area is 65,500 square miles, and the white population is 840. The colony is governed from the Canary Islands, with local headquarters at Villa Cisneros, a small village situated on the seacoast.

RIO GRANDE, *re' oh grahn' day*, an important river which forms about half of the international boundary line between the United States and Mexico. Rising in the Rockies of Southwestern Colorado, it flows south through New Mexico, then follows a southeasterly course between Texas and Mexico, emptying into the Gulf of Mexico near the town of Brownsville, Tex. It has a total length of about 2,000 miles, but is of little value for navigation. In its upper reaches there are numerous gorges and cataracts, and for miles

along its middle course, it flows through an arid country. Large quantities of its waters are used for irrigation purposes, so that, during the hot weather, its bed becomes almost a dry valley in some sections. The region along the Rio Grande has been the scene of many border disturbances. During the Mexican revolutionary disturbances of 1929, the United States kept a patrol of airplanes over the river bed. No serious trouble occurred in the area.

RIO NEGRO, *na' gro*, one of the chief streams of the Amazon river system. The Rio Negro flows through the equatorial forest region of South America. By some geographers, the Guainia, rising in Southeastern Colombia, is considered the head stream; others consider the head stream to be the Uaupés, which rises in the Andes in Western Colombia. The former flows in a northeasterly direction to the boundary of Venezuela, then turns to the southeast and makes its way into Brazil, where the Uaupés joins it. From this point, the river flows in a general southeasterly direction, emptying into the Amazon through an estuary fifty miles above the Madeira River. Including the Uaupés, the Rio Negro is 1,400 miles in length. Long stretches of the upper river are navigable, but the stream is of little value commercially, because it flows through a wild and unsettled country. The thriving city of Manáos is located on its banks ten miles above its mouth, and the Rio Negro, from this point to the Amazon, is an important trade route for ocean vessels.

RIO PECOS, *pa' kose*. See NEW MEXICO (Rivers and Lakes).

RIOT, *ri' ul*. In criminal law a riot is an offense against the public peace by persons who have banded themselves together, without authority, for the purpose of assisting one another in threatening or doing violence to an individual, a corporation, or a government that has worked a real or supposed injury to them. A riot is characterized by such disturbance as to jeopardize public safety or to cause public terror. At least three people must engage in the disturbance to have it recognized as a riot; in law, a similar offense committed by fewer than three is an *affray*.

The statutes of different states and provinces fix the penalty of those convicted of engaging in a riot. If rioting results in loss of life, the penalty is more severe than when destruction of property alone is involved. If the riot is against the government, those engaged in it may be convicted of treason. Historic riots in the

United States include the Boston Massacre (1770), the New York draft riots (1863), and the anarchist riot in Chicago (1886).

Riot Act. This was an act passed by the British Parliament during the reign of George I. It was commanded to be read aloud by a justice of the peace, or any other authorized officer of the law, whenever people assembled themselves for the purpose of creating a disturbance or committing any other unlawful act. It commanded the people to disperse, in the name of the sovereign. In America, "to read the riot act" has come to be a slang expression for uttering a severe reprimand.



RIP AWAKES FROM HIS LONG SLEEP (SEE NEXT PAGE)

RIO TÉODORO, *ta' o dor. o.* See BRAZIL (Rivers and Transportation).

RIPARIAN, *rih pa' rih an*, RIGHTS. The owner of land bordering on a stream that is not navigable owns that portion of the bed of the stream which adjoins his land, as far as the central line or middle of the stream. He is also entitled to his share of the water for such uses as will not impair its availability for any purpose farther down the stream. He is not entitled to all the water, nor can he make such use of the stream as will pollute it; furthermore, he cannot turn it into another channel, if by so doing he prevents those farther down the stream from enjoying the natural benefits they would receive from it.

These rights are known in law as *riparian rights*, and the owner is known as a *riparian proprietor*. The term is derived from the Latin *ripa*, meaning *river bank*. Its use has been extended to embrace the rights of a landowner whose property borders a lake or other body of water. The remedy for violation of riparian rights is usually through injunction (which see).

RIPOSTE, *re pohst'*. See FENCING.

RIPPLING. See FLAX.

RIPUARIANS, *rip yu a' rih anz*, a division of the ancient Franks (which see).

RIP VAN WINKLE, *wink' 'l*, a famous story by Washington Irving, published in 1819, in the *Sketch Book*. Rip, the title character, is a lazy, good-natured, intemperate ne'er-do-well, henpecked by his impatient wife. On one of his hunting trips, Rip meets with Henry Hudson and his crew in the forests of the Catskills. He drinks of liquor which he is compelled to serve to his companions, and as a result, falls into a sleep from which he does not waken for twenty years. Returning then to his home, he finds that his scolding wife has died, as have most of his old friends; his daughter has married, and his country, which, when he fell asleep, was a colony of England, has become a republic. The story was dramatized several times before Boucicault, in 1866, produced the more effective version that Joseph Jefferson made famous. See IRVING, WASHINGTON; JEFFERSON, JOSEPH; and page 6134.

RISSE'S, *ris' oze*, DOLPHIN. See GRAMPUS.

RISTORI, *rees toh' re*, ADELAIDE (1822-1906), an Italian actress, born at Cividale del Friuli. Her parents were strolling players, and she began while a child to take part in their crude plays. At the age of fourteen, she gained a position with a reputable company, and won fame as Francesca da Rimini in the tragedy of that name. Her next great success, achieved when she was eighteen years old, was her interpretation of the heroine's rôle in Schiller's *Mary Stuart*. Her beauty and talent had by this time attracted many ardent admirers, and

one of these, the Marquis del Grillo, she married in 1847.

Each year she added to her stage triumphs, until, in 1855, she was called to Paris, where she surpassed all her former efforts. Seldom, if ever, had there been a similar sensation in the theatrical world. The great Rachel, whose equal as an actress many French critics had declared could never exist, was playing in the city at the same time, and crowds argued over their respective merits with such anger that many persons came to blows. In 1857, when Ristori played in Spanish at Madrid, her enthusiastic audiences shouted their admiration. She visited America three times between 1866 and 1885, and retired from the stage in 1888 with the consensus of Italian critics that she was the greatest actress Italy had ever produced.

RITO DE LOS FRIJOLES, *re' to day los fre ho' lase*. See NEW MEXICO (History).

RITTY, JAMES, inventor of the cash register (which see).

RIVER. All the facts associated with the formation of a river and the uniting of streams into a river system may be observed in a roadway after a shower. The drops of water collect into little rills, which unite with others to form larger rills, and a number of these unite and form a main stream, which carries the water down the embankment. Each tiny stream wears its channel in the soft earth, and the raindrops that flow in one are separated from those flowing in another by a little ridge or a gentle slope, whose crest forms a watershed in the miniature landscape. However large a river may be, it has been formed in a manner similar to that of the little stream flowing down the embankment. The only difference is that, in case of the river, we deal with larger facts.

A river usually has its beginning far up in the mountains or hills, with a little spring or a melting glacier for its source. As it flows on, other streams join it, and it continues to increase in volume. The river wears for itself a channel which is lower than the surrounding country. The bottom of the channel is known as the *bed* of the stream, and the sides are the *banks*. The *right bank* of a river is that on the right hand of the observer when he is facing downstream. A river and all its tributaries constitute a *river system*. The area drained by a river system is known as the *river basin*.



Photo: Brown Bros.

ADELAIDE RISTORI

The basin of the Mississippi, for instance, includes that portion of the United States drained by that stream and its tributaries. The volume of a river depends upon the area of its basin and the amount of rainfall. Heights of land which separate rivers and river systems are known as *divides*.

The Work of Rivers. The course of a river is divided into three parts—the upper, middle, and lower courses. These parts are seldom of equal length, and each is marked by distinctive characteristics. In the upper course, the slope of the channel is steep and the current is swift. The gradient is more than fifty feet to the mile.

The channel has been worn down rapidly and the banks have a steep slope, sometimes being nearly perpendicular. The water carries quantities of sand and gravel and sometimes rocks of considerable weight, which are borne swiftly along by the current, constantly wearing away the bed of the stream. The swiftness of the current enables it to remove most of the obstacles in its course, and the channel is free from small curves. The channels of the tributaries are usually worn down to the level of the main channel, forming *ravines*.

The river enters upon its middle course when it leaves the mountainous or hilly region in which it rises, and enters the lower lands, where the slope is more gentle. Its gradient now is no more than ten feet, and often less than two feet, to the mile.

The current is not swift enough to carry the heavy material that it has brought down to this point, and this is deposited on the bottom of the channel. For this reason, the beginning of the middle course of many rivers is marked by gravel beds. Since the channel is worn more slowly, the slope of the banks is more gentle and the valley broader. Because the current has lost much of its velocity and cannot remove obstacles, it must flow around them; thus the middle course is characterized by numerous curves, some of which may take the river miles out of the general direction of its flow. The middle course of the Mississippi affords an excellent illustration of this fact. Again, obstructions in the middle of the channel collect deposits of silt until, finally, they reach the surface and form islands. Islands in the upper part of the stream, on the other hand, consist of rocks which the current has been unable to wear away.

The lower course of a river differs but little from the middle course. The current is slower, and the continuous deposit of silt raises the bed of the stream. Its gradient now is only a few inches a mile. Frequent overflowing of the low banks forms vast flood plains which, when drained, make productive farms. In case of the Mississippi, this process of raising the

river bed has continued until the river is higher than the surrounding country, and disastrous floods follow a break in the banks, which must therefore be protected by levees.

River Pollution. See WATERWORKS; SEWAGE AND SEWERAGE.

Cataracts and Canyons. Rivers frequently flow over rocks of unequal degrees of hardness; the softer rock is worn away, leaving the harder as an obstruction. These conditions are usually found where the current is swift, and rapids or cataracts are formed. The cataracts of the Nile and the rapids in the Saint Lawrence are good illustrations. When the soft rock lies under a hard layer, a fall like Niagara is formed. In mountainous regions, the swift current sometimes wears a deep channel with vertical walls, forming a canyon. The Grand Canyon of the Colorado and the Grand Canyon of the Yellowstone, two of the world's most stupendous wonders, were formed in this way. The velocity of torrents sometimes reaches twenty miles an hour.

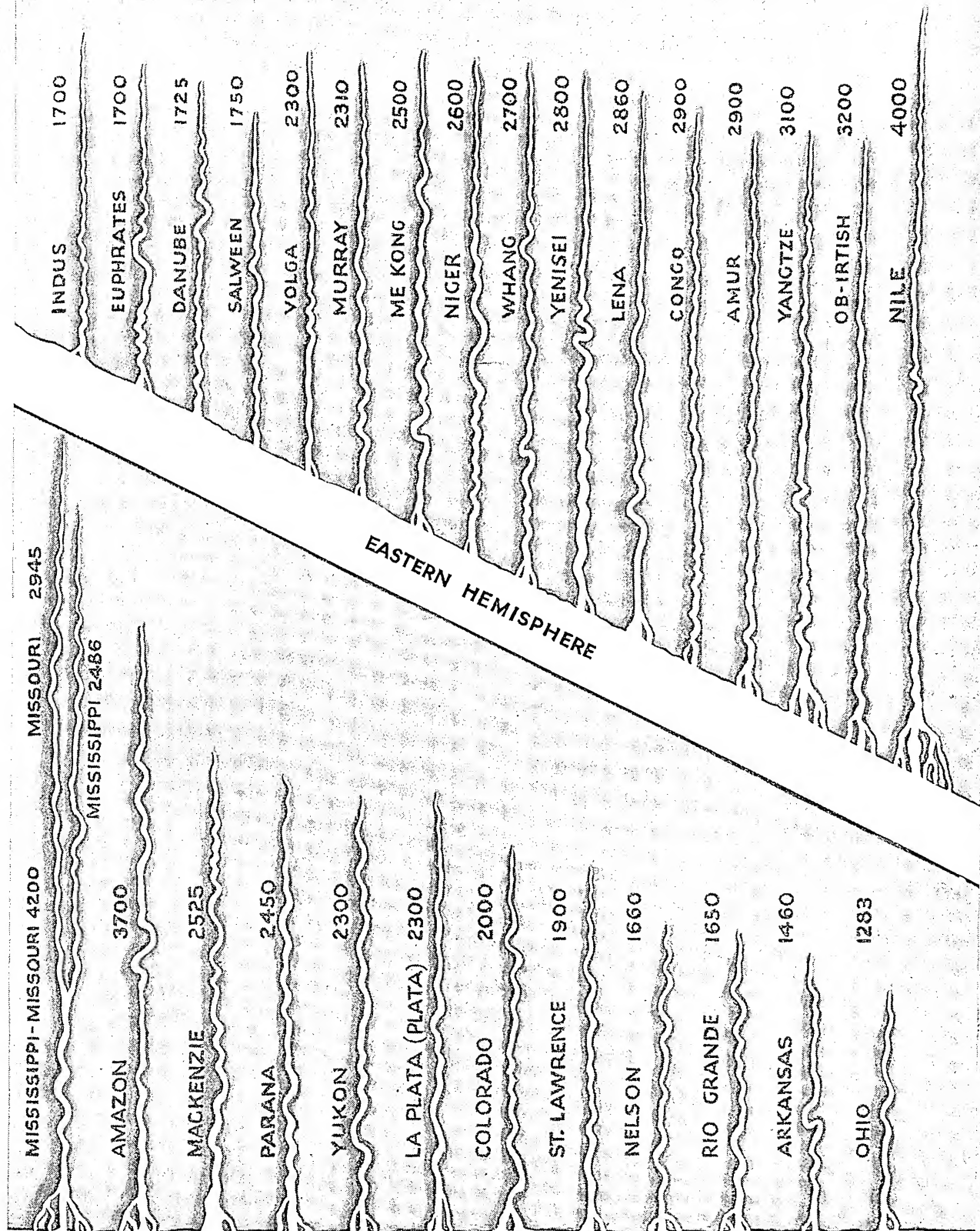
Estuaries and Deltas. A river flowing slowly into an arm of the sea, protected from great waves and high tides, deposits its silt at its mouth and builds up an alluvial plain called a *delta*. The deltas of the Mississippi and the Nile are excellent examples of such formations. When the bed of the river in its lower course slopes into the sea, forming a drowned valley up which the tides extend without obstruction, the silt is carried away and the mouth of the river remains a broad estuary, like the Gulf of Saint Lawrence and the Rio de la Plata. These estuaries form harbors, and upon them we find some of the greatest seaports. R.H.W.

Related Subjects. The reader is referred to:

Alluvium	Flood Plain
Basin	Levee
Conservation	Rain
Delta	Spring
Divide	Valley
Erosion	Waterfall
Flood	

In addition to these general articles, these volumes contain articles on the following rivers:

AFRICA	
Congo	Orange
Gambia	Senegal
Niger	Victoria Falls
Nile	Zambezi
ASIA	
Amur	Lena
Brahmaputra	Mekong
Euphrates	Nerbudda
Ganges	Ob
Hwang	Sutlej
Hugli	Tigris
Indus	Yalu
Irrawaddy	Yangtze
Jordan	Yenisei
AUSTRALIA	
Cooper's Creek	Murrumbidgee
Murray	



WESTERN HEMISPHERE

Longest Rivers of the World. Most of these rivers are described in THE WORLD BOOK ENCYCLOPEDIA. Figures indicate miles.

EUROPE

Arno	Oder
Avon	Po
Clyde	Rhine
Danube	Rhone
Dnieper	Rubicon
Dniester	Saône
Don	Save
Elbe	Scheldt
Garonne	Seine
Loire	Somme
Main	Thames
Marne	Tiber
Meuse	Ural
Moselle	Vistula
Neva (page 6264)	Volga

NORTH AMERICA

Alabama	Moose
Allegheny	Nelson
Apalachicola	Niagara Falls and River
Arkansas	Ohio
Assiniboine	Ottawa
Atchafalaya	Ouachita
Athabaska	Peace
Bighorn	Pecos
Brazos	Penobscot
Canadian	Platte
Chattahoochee	Potomac
Chaudière	Rappahannock
Churchill	Raritan
Colorado	Red
Columbia	Red River of the North
Connecticut	Restigouche
Cumberland	Rio Grande
Delaware	Roanoke
Detroit	Sabine
East	Sacramento
Fraser	Saguenay
Genesee	Saint John
Gila	Saint Lawrence
Great Kanawha	Saint Mary's
Green	San Joaquin
Housatonic	Saskatchewan
Hudson	Savannah
Humboldt	Schuylkill
Illinois	Scioto
James	Shenandoah
Kennebec	Skeena
Kentucky	Snake
Kootenay River and District	Stikine
Lackawanna	Susquehanna
Lehigh	Tennessee
Mackenzie	Tombigbee
Merrimack	Wabash
Minnesota	Washita
Miramichi	White
Mississippi	Willamette
Missouri	Wisconsin
Mobile	Yazoo
Mohawk	Yellowstone
Monongahela	Yukon

SOUTH AMERICA

Amazon	Parana
Madeira	Pilcomayo
Magdalena	Rio de la Plata
Orinoco	São Francisco
Paraguay	Tapajos
	Uruguay

RIVERA, *re va' rah*, DON MIGUEL PRIMO.
See PRIMO DE RIVERA.

RIVER HORSE, a name sometimes applied
to the hippopotamus (which see).

RIVER OF DOUBT. See BRAZIL (Rivers
and Transportation).

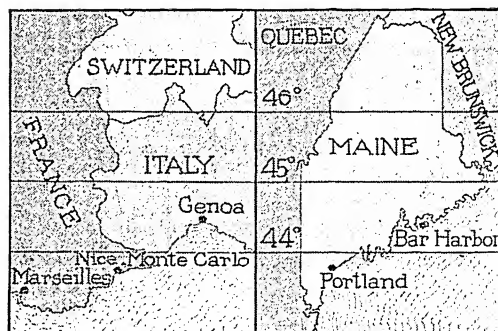
RIVERSIDE, CALIF. See CALIFORNIA (back
of map).

RIVERSIDE DRIVE. See NEW YORK
CITY.

RIVES, *reevz*, AMÉLIE (1863-), a well-
known American novelist and playwright,
born at Richmond, Va. In 1888 she married
John A. Chanler, from whom she was divorced.
Since her marriage to a Russian nobleman,
in 1896, she has been PRINCESS TROUBETZKOY.
Her popular novel, *The Quick or the Dead*, was
the most talked-of book in America when it
was first published, in 1888, and on its appear-
ance, the young author stepped from obscurity
to wide celebrity. It describes the spiritual
struggles of a beautiful woman who has lost
her idolized husband, and who wins the love
of his cousin, almost the former's duplicate in
personal appearance. In the end, after terrible
mental anguish, she decides that the influence
of the dead is too potent a factor in her life for
her to marry the "quick," that is, her husband's
cousin. This novel was discussed, attacked,
and applauded; was barred from libraries and
championed in pulpits.

Other Works. Her later novels include *Witness
of the Sun*, *Barbara Dering* (a sequel to her most
famous story), *Athelwold*, *Damsel Errant*, *Hidden
House*, *World's End*, and *The Ghost Garden*. Princess
Troubetzkoy has also done considerable work in the
field of dramatic literature; her plays include *The
Fear Market*, *Allegiance*, and *Love-in-a-Mist* (with
Gilbert Emery), and a dramatization of Mark Twain's
The Prince and the Pauper.

RIVIERA, *re vya' rah*. Along the Gulf of
Genoa, at the northern end of the Tyrrhenian
arm of the Mediterranean Sea, there is a nar-



WINTER AND SUMMER RESORTS IN THE SAME LATITUDE

While Maine harbors are blocked with ice, orange,
olive, and palm trees are at their best on the Riviera,
but while the people of Nice are enduring the dry
heat of summer, Americans are flocking to the cool
coasts of Maine. The comfortable winters of the
Mediterranean land are due to warm winds from the
South Atlantic; the lower temperature of New Eng-
land results from the nearness of the icy Labrador
Current.

row strip of land of enchanting beauty—the
Riviera. Nowhere else in the world are the
skies and water more blue or the sun more

golden than along this seacoast region of France and Italy. Extending for a distance of 172 miles, between the mountains and the sea, it provides a health resort and playground for travelers from all over the globe. The sun and the south winds warm it, while the Alps in the background, gray and green with vineyards and olive groves, and with swift little rivers and clanking mill wheels, shut off the north and east winds. From the French Nice in the west to the Italian Spezia in the east, the towns and villages are almost continuous. One may journey among them over a fine motor road, originally built by the Romans, or by a railroad which burrows through the many projecting headlands by scores of tunnels.

The towns are very picturesque, with houses that are rose and cream and brown in color, with green and fragrant gardens, and with shops filled with curios and trinkets that are a continuous delight to the tourists, invalids, and convalescents who throng there throughout the winter months. Great masses of roses, violets, and hyacinths are cultivated for the London and Paris markets, as well as subtropical fruits, dates and bananas, pomegranates and prickly pears.

The Riviera towns include Nice and Mentone, in France; Monaco and Monte Carlo, in the principality of Monaco; and Bordighera, Ospedaletti, San Remo, Rapallo, Genoa, and Spezia, in Italy. See FRANCE (Physical Features); ITALY.

RIZA SHAH PAHLEVI (1877-), shah of Persia from 1926 to 1941, who rose from a position as private in the shah's Cossack bodyguard to sovereign heights in the Persian government. He was born of poor parents. In early youth he joined the army, eventually becoming one of the senior officers of the Cossack division. From 1917 to April, 1926, when his coronation as shah took place, his career was meteoric.

In 1917 Riza Shah forced the commander of the Cossack division to relinquish his office, and in 1921, with about 4,000 men, he captured Tehran, became commander in chief of the Persian army, overthrew the existing Ministry, and set up a new Cabinet. He took over the post of Premier in 1923, instituted a series of reforms, modernized the various departments, and assisted the American financial director,

Dr. Millspaugh, who was in the employ of the Persian government.

It had been the habit of the young shah to go to Paris on prolonged visits. In 1925, when he sought again the gaiety of the French capital and resisted the efforts of his Ministry to get him home, he was deposed. Riza Shah was placed at the head of a temporary government in December, 1925, and in April, 1926, was raised to the royal dignity. Thus the new Pahlevi dynasty (this being Riza Shah's family name) began. In 1941, under Allied pressure (see WORLD WAR II), Riza Shah abdicated and was succeeded by his son. See PERSIA (History).

RIZZIO, *reet' se o*, DAVID. See MARY STUART; DARNLEY, HENRY STUART.

ROACH. See COCKROACH.

ROAD RUNNER, a swift-footed bird of the cuckoo family, found in the Southwestern United States and Northern Mexico, known

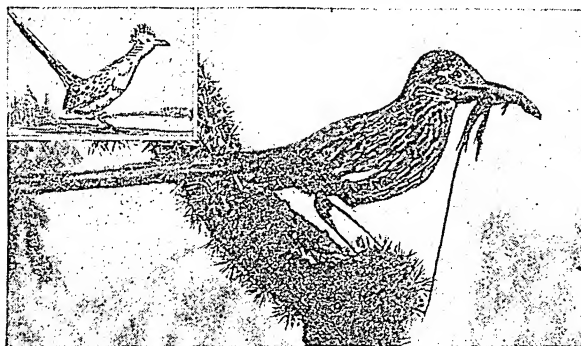


Photo: Wide World

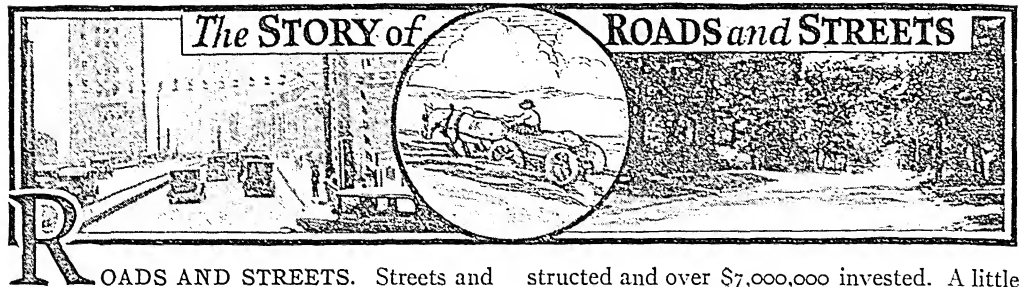
THE ROAD RUNNER

The small corner illustration shows the bird "at attention." In the larger picture it is seen bearing a whip-tail lizard to its young.

also as the *chaparral cock*, *ground cuckoo*, and *snake killer*. The name *road runner* refers to its habit of racing down the road in front of horsemen or vehicles. When it runs, it spreads wings and tail into a sort of airplane, and speeds along at an amazing rate. The road runner is nearly two feet in length, and has long legs with two toes at the front and two in the back. Its large tail has graduated feathers and can be erected saucily at will. Its nest, which is placed in low trees or bushes, is made of sticks. In it are placed the two to nine whitish eggs. The road runner feeds on insects, mice, lizards, snails, young snakes, and birds, with some fruit. See illustration, page 6002. D.L.

Scientific Name. The road runner belongs to the family *Cuculidae*. Its scientific name is *Geococcyx mexicanus*.

ROADS, BUREAU OF PUBLIC. The Federal Bureau of Public Roads, formed in 1893 to aid the good-roads movement, was a branch of the United States Department of Agriculture until 1939, when it became the Public Works Administration in the Federal Works Agency. It has headquarters in Washington, D. C., and a district office in each of thirteen districts scattered throughout the country. Some of the activities of the bureau are given in the following article (see ROADS AND STREETS). See, also, AGRICULTURE, UNITED STATES DEPARTMENT OF.



ROADS AND STREETS. Streets and highways have often been called the arteries of a city or a nation, because the free and continuous movement of vehicles, carrying passengers and goods, is as necessary to the life of the community as the flow of the blood to the life of the human body. Even the least civilized parts of the globe, if inhabited at all, are criss-crossed by trails for travel on foot. With the coming of civilization, these trails become paths for horses and other beasts of burden; then roads for wheeled vehicles.

The material strength and prosperity of ancient nations can be largely gauged by their highway systems. The Roman roads which, nearly two thousand years ago, were built to connect that imperial city with its distant provinces are known the world over, and some of these roads are still in use, almost as the Romans left them.

Roads in Europe. For many years the principal countries of Europe—England, France, Switzerland, and later Germany—have paid great attention to their highway systems, of which the main thoroughfares have always been under supervision of the national government and in charge of trained engineers. Until the invention of the steam engine and the development of the steam railroad, mainly within the last 100 years, these roads and the waterways furnished the only means of communication between the different cities and districts. Hence these older countries have highly developed systems of improved roads; in fact comparatively few unimproved dirt roads will be found in western Europe. Granite block and asphalt are most commonly used, with macadam in the country districts.

In the United States and Canada. In the eastern part of the United States, before and around 1800, highways were gradually developed as far as the limited resources of the young country would permit. To supplement the roads which the states and counties were able to build, privately owned turnpikes were authorized, with a tollgate every five or ten miles. Many such roads remained in common use until after the War of Secession.

In twenty years, starting in 1792, over 300 charters for turnpikes were granted to private companies, over 4,500 miles of road were con-

structed and over \$7,000,000 invested. A little later the Federal Government itself undertook construction of the Cumberland Road (which see).

Soon, however, the new "iron horse," traveling on steel rails, began to offer a rival means of transportation—more expensive in first cost, but vastly more swift, comfortable, and economical. The railroads became the basic long-distance transportation system of the nation, and roads were necessary only to bring the farmer or other settler and his goods to the nearest railroad station. With the rapid development of America westward to the Mississippi, then to the Rockies and the Pacific, the new and growing communities had no time or money to spend on improved highways.

Since 1900, however, the highway picture in the United States and Canada has undergone a complete change (see *AUTOMOBILE*). The automobile, capable of ever-increasing speeds and distances, demanded dustless, mudless, and rutless roads—and got them. The motor age is also a highway age.

In 1940 the United States had more than 3,000,000 miles of highways, not including city streets; and of these, more than 1,200,000 miles had been surfaced with gravel, macadam, or concrete—a percentage still far below that of the western European nations, but growing each year.

Improved Roads and Pavements. The trail of the red Indian, and the village cow-path, were developed into ordinary dirt roads by using just enough man and horse labor to straighten the worst kinks, cut down the steepest ridges, and fill the deepest gullies, so as to permit use by horse-drawn buggies and wagons. In contrast an *improved* road means two things: first, grading and draining to minimize disturbance by flood or frost; and second, a surface covering of some reasonably firm and durable material. To these, modern highway design adds a third requisite, realignment, which means straightening the road both horizontally and vertically to meet the demands of high-speed motor vehicles—cutting down the hills, filling or bridging the valleys, and straightening the curves to an extent far exceeding the requirements of former slow transportation. At the crossings of an important highway with a railroad or another highway,

an over- or under-pass is built, to prevent accidents and congestion, where the volume of traffic is great enough to justify the heavy expense of such construction.

Ancient Babylon had paved streets (pavement from the Latin *pavire* meaning *to beat* or *tread down*). Its streets probably consisted of beaten clay, laid to a considerable depth to present a hard and even surface. Roman roads were made of masonry, as much as four feet thick, the top layer being of flat stones closely fitted together—a construction of ample strength for the light traffic of those days.

Concrete. The best highways of today consist of, or are laid upon a base of, concrete (which see), often reinforced with steel. The concrete is either finished to use as the wearing surface, or is covered with a layer of sheet asphalt (which see) or, less frequently, paving brick or stone blocks; the latter, if of granite, form the most durable though not the smoothest surfaces.

Macadam. A less expensive type of highway is made of crushed stone and called macadam after the name of its inventor, John L. McAdam (1756-1836), a Scotch engineer. The first and still the most common pavement is water-bound macadam, that is, the stones are held together by a natural cement of dust and moisture, packed together, when wet, under

the weight of heavy road-rollers. This type of pavement marked a great advance over former methods, but it does not wear well under heavy or fast traffic such as the modern motor vehicle. Improved types are bituminous macadam, made similarly except that asphalt or tar is used for the binder, and cement bound macadam for which a portland cement and sand grout is used for the binder.

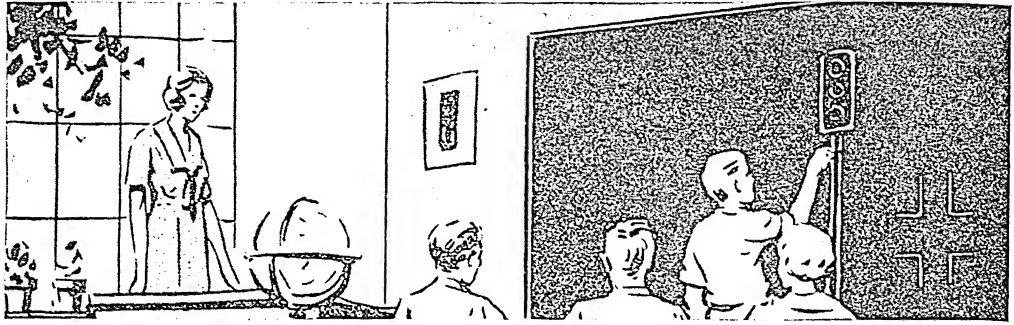
Gravel. The gravel road is the least expensive type of improved or surfaced highway and is suitable only for relatively light traffic. It consists of a layer of gravel spread over a carefully graded and drained base of earth, both the sub-grade and the gravel surface being sloped to the sides to throw off the rain water. Gravel roads require frequent attention to keep them in good condition and prevent the formation of ruts and holes. Even then they are dusty in dry weather and are not as safe for high-speed automobiles as the harder surfaces. To make it wear better, and produce less dust, a gravel road is often coated with a thin layer of oil or light tar, or with calcium chloride which, by attracting moisture out of the air, prevents excessive dust.

State and Federal Highways. Our modern highway systems have been made possible through the leadership of the Federal and state governments. When the old dirt roads



ROADS OF YESTERDAY AND TODAY

The two illustrations at the top show a road in Pennsylvania before and after improvement; below, a New York road cut into ruts and almost impassable, and as it appears in this modern age.



THE SCHOOL TRAINS FOR SAFETY

built and controlled by the township, or at most by the county, proved sadly inadequate for the automobile, the state had to step in. Every state now has a highway department to which is given supervision over a designated system of state highways, either alone or in cooperation with the counties. The state highways now form about 11 per cent of our total highway mileage but more than 30 per cent of the improved mileage.

As much of the travel through an average rural township consists of persons and goods not coming from or to that township, but simply passing through it on their way from one city to another, it is necessary and proper that the cost of building and maintaining such highways should be shared by all the people of the state, through the state government. Most if not all of the cost of this highway work is provided by those who use it, through the gasoline taxes and other vehicle taxes imposed by the states.

Modern needs, however, require not only state-wide systems but a nation-wide system of smooth, comfortable, safe highways. The stream of private automobiles, buses, and trucks, traveling between distant states, demands highways across sections of the intervening commonwealths, which in some cases the state hardly needs for its own use and perhaps cannot afford. For this and other reasons the national government has stepped in, and under supervision of the United States agency called Public Roads Administration has given Federal aid to the states and thereby made possible the gradual development of a magnificent national system of highways. This financial help has been given only on condition that the highways be built to modern standards of durability, comfort, and safety. Each Federal highway is given an identifying number over its entire length, and an increasing percentage of these roads is provided with uniform signs directing and cautioning the traveler. Most state highways also are numbered and marked. About 17 per cent of the expenditures on highways in 1939 consisted of Federal-aid

payments to the states, taken from the general revenues of the Federal Government and constituting an important item in the Federal budget.

Highways are of social and educational as well as business value. They, together with the telephone and the radio, have done away with the former isolation of the farmer and his family by giving him quick and easy communication with his neighbors and the nearby towns and cities. They are causing the old one-room country school to disappear, by permitting the transportation of pupils from miles around to a consolidated school with adequate equipment and teachers.

City Street Systems. One cannot imagine a city without streets. We have already mentioned those of ancient Babylon. The Greek, Roman, and other old cities had streets with some sort of pavement, but often very narrow and winding, and sometimes so steep as to resemble a flight of stairs.

In this country many of the older cities, along the Atlantic Coast, have narrow, irregular streets. It is said that those of old Boston follow the lines of the cow-paths of the original farming village.

Street Planning. In contrast, the newer cities in other parts of the United States generally have a rectangular or checker-board street plan. In many cases geometrical regularity has been carried to an extreme, with too little regard for the natural topography and the different needs of business, factory, and residential districts, and too little distinction between streets carrying through traffic and those serving only local neighborhoods. With the growing recognition of city planning (see page 1440) more attention is now being given, in laying out new streets, to these other considerations. Many cities now have a *major street plan* in which it is recognized that certain selected streets should be made as attractive and convenient as possible for through traffic. On the other hand in laying out new residential subdivisions the streets may be much narrower, may follow the natural slope



RENDERING A VALUABLE SERVICE

of the ground, and need not "get anywhere" except to the homes which they serve.

Traffic Problems. The most difficult street-traffic problems are found in the centers of large cities where the streams of traffic come together from all directions and where the high land values make it very costly to widen the streets. Our large cities have spent hundreds of millions of dollars for this purpose, buying strips of land and tearing down portions of the buildings on one or both sides of important thoroughfares. Other less drastic measures, good as far as they go, include: widening the roadway by reducing the width of sidewalks; rounding the curbs at the corners; reducing excessive crown in the center of the street; repairing pavements to make the whole width of the street available for traffic; installing the best possible traffic-control signals; restricting parking; establishing through streets and one-way streets; and laying out routes by which some of the traffic may go around instead of

through the heart of the city—all for the purpose of getting maximum efficiency out of the existing street system. In a very few cases, elevated roadways or double-decked streets have been built at great cost, the upper level being generally used by passenger and other high speed traffic while the lower level takes care of cross traffic and trucks. Examples are the elevated highway along the Hudson River in New York City, and Wacker Drive and a portion of Michigan Avenue in Chicago. Similar in purpose are the New Jersey viaducts which eventually will provide an elevated thoroughfare over six miles in length, running westward from Jersey City. The extremely high cost of such construction makes it feasible only where both the land values and the traffic are extraordinary.

The types of pavements for city streets are the same as those already mentioned—*asphalt, bituminous macadam, brick, stone, and concrete.*

Traffic Regulation and Safety

If everyone walking or riding on the highway were to follow his own will, in disregard of other riders and walkers, hopeless confusion would result. It has always been necessary to have a common understanding as to how the highway shall be used—that is, to have traffic laws. When, in the days of Julius Caesar, the parking of chariots and other vehicles on the narrow streets of Rome caused congestion, a regulation was established forbidding vehicles to come into the city during the busy hours of the day.

History of Traffic Laws. In 1285 a law was passed in England providing that "all trees and shrubs must be cut down for a distance of 200 feet on either side of the roads between market towns to prevent the concealment of robbers."

The demands of public safety on the streets were recognized in this country as early as 1678 when in the colony of Rhode Island the

Assembly adopted a resolution which stipulated that:

"Whereas there was very lately in the Towne of Newport on Rhode Island very great hurte done to a small childe by reason of exceeding fast and hard riding of horses in said towne" any person who "shall presume to ride on either horse, mare, or gelding, at a gallop or to run speedily" should be fined 5 shillings.

In 1757 the Board of Selectmen of Boston passed this ordinance:

"Owing to great danger arising oftentimes from coaches, sleighs, chairs, and other carriages, on the Lord's days, as people are going to or coming from the several churches in this town, being driven with great rapidity and the public worship being oftentimes much disturbed by such carriages, it is therefore voted and ordered that no coach, sleigh, chair, chaise, or other carriage shall at such times be driven at a greater rate than a foot pace, on penalty to the master of the slave or servant so driving of the sum of 10 shillings."

General rules of the road were passed in England in 1822. Even before that, in the reign of Henry VIII, an innkeeper had been brought before a magistrate for storing his

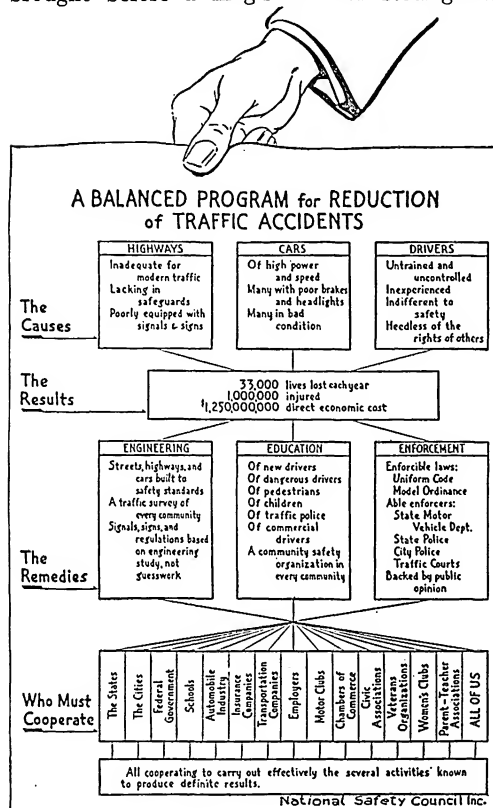
automobile, not only the old streets and highways but the old, simple traffic regulations became inadequate. Since 1900 there has been a great expansion of the state laws and city ordinances in the United States and Canada resulting in innumerable conflicts on many items such as the right of way, speed regulations, parking restrictions, and headlights. A tourist might, in one day, drive through a hundred different communities, each having its own traffic regulations. This condition led to a general demand for uniformity. In 1926 the Uniform Vehicle Code and in 1928 the Model Municipal Traffic Ordinance were formulated by the National Conference on Street and Highway Safety, composed of officials and other experts from all over the country called together by the Secretary of Commerce. These laws have now been adopted by an ever growing number of states and cities.

Traffic Control Signals. The first system of colored signal lights, to tell the traffic when to stop and when to go, was installed on Fifth Avenue, New York City, about 1920. Soon the use of traffic control signals became general all over the country and the present standard color code was developed: red to stop, green to go if the way is clear, and yellow indicating an impending change. The "simultaneous" systems, in which all signals show the same color in the same direction at the same time, have given way in most cities to the more efficient "progressive" type of control in which the signals at successive corners change in progression, allowing the vehicles to keep moving at a predetermined speed. A still newer type of signal is called "traffic-actuated" because it changes only when a vehicle approaches on the cross street.

Road Markings. During recent years, the states and cities also have put up thousands of signs to inform and warn the driver with regard to railroad crossings, curves, cross-roads, school houses, and other points of possible danger, as well as to tell him what route to follow to his destination. The conflicting shapes and colors of these signs became almost as great a nuisance as the conflicting laws and ordinances. This resulted in the formulation of a standard system of highway and street signs, signals, and markings, by the United States Bureau of Public Roads and associated bodies.

A growing number of cities and states now have traffic engineers or traffic engineering departments whose duty it is to study the local traffic conditions and accidents and determine just what signals, signs, regulations, and other remedies will best meet the situation.

Enforcement of Traffic Regulations. To secure obedience of all drivers to these signs, signals, laws, and ordinances has become one of the most difficult and important functions



HOW TO REDUCE TRAFFIC ACCIDENTS

The above chart shows graphically the relation of elements in the problem of accident prevention.

vehicles and those of his guests on the road in front of his inn. The case finally came before the House of Lords, which body decided that "an innkeeper must not make a stable of the King's highway." When the steam engine was invented and was first used to propel vehicles on the highway, the British Parliament required in 1836 that a man must walk in front of each vehicle with a red flag to warn pedestrians.

Some customs or rules of the road developed differently in different countries. In England and most of Continental Europe today, vehicles are driven on the left side of the road, instead of the right side as in the United States, Canada, and other countries. This makes it confusing, and at first very difficult, for an American to drive in England or vice-versa; even though he knows the local rule, in an emergency he is apt to follow the habit acquired at home.

Modern Tendencies. With the advent of the

of our state and city police departments. A modern, efficient police department must provide officers to direct traffic at the busy corners and other officers on motorcycles or in cars to patrol the streets. It must also collect and analyze reports of all accidents, and it must do what it can to educate the people, both old and young, to use the streets carefully and safely. The difficulty of this task has been greatly increased by the fact that these new functions have been imposed on the police departments without a corresponding increase in the number of men.

To control traffic on the highways, nearly all the states have established state highway police. In addition to patrolling the roads, the highway police generally give the license examinations to new drivers, in those states that require the licensing of all motor-vehicle operators. A few of the states have not yet adopted this life-saving measure, although it is the only way a state can keep incompetent and dangerous drivers off the highways.

One thing that makes the enforcement of traffic regulations so difficult is the fact that most traffic violators are not criminals. They consider themselves good citizens and object strenuously if they are arrested or even warned by the police for violating the speed limit or the parking ordinance. These violators do not realize that these offenses, which they consider unimportant, actually contribute to a great many accidents in which people are killed or injured. In 1940, deaths resulting from motor vehicle accidents reached a total of 34,400 in the United States, or more than twice as many people as are accidentally killed in all industries and occupations. Of this number more than 3,000 were children under fifteen. But the motor vehicle deaths of children have been decreasing, while those of adults have been mounting.

The statistics show that there has been an actual decrease in the number of commercial vehicles—trucks, taxicabs, and buses—involved in accidents, contrasted with a great increase in the number of private passenger cars so involved. Detailed statistics regarding motor vehicle accidents may be obtained from the city police departments, state motor vehicle departments, and the National Safety Council, Chicago.

Safety. The prevention of these accidents, which annually cause so much sorrow and suffering as well as financial loss, requires a combination of the three E's—Engineering, Education, and Enforcement. In addition to making highways and motor vehicles as safe as engineering skill can devise, in addition to passing the best possible traffic laws and providing honest and energetic enforcement of them by police and courts, it is necessary to impress on drivers and pedestrians of all ages

the great importance of carefulness and courtesy in the use of the streets. Everyone who drives an automobile should understand the traffic regulations and know how to handle a fast-moving, powerful machine in modern traffic.

The safety instruction now so generally given in the schools, and the work of the school-boy patrols, is undoubtedly responsible for holding down the deaths of children as already mentioned. Most of the large companies operating fleets of vehicles now conduct an organized safety program or campaign including the careful selection and training of drivers, recording and analysis of all accidents, special training or discipline for drivers who have a bad accident record, and bonuses and other rewards for those who make a clear record. Again, this work is largely responsible for the better showing of the employed drivers as compared with those who drive their own cars.

In many cities and some states those interested in safety have combined to form community safety councils or to promote safety activities through local chambers of commerce, or other civic organizations. S.J.W.

[See map in article UNITED STATES for directions of the principal automobile routes.]

Related Subjects. The following articles in these volumes may be consulted in connection with this discussion of roads and streets:

Asphalt	Dixie Highway
Automobile	Lincoln Highway
Cement	Pioneer Life
Concrete	Safety
Cumberland Road	Trails of Early Days

ROANOKE, JOHN RANDOLPH OF. See RANDOLPH, JOHN.

ROANOKE, *ro' a nolh*, VA., an industrial city in Roanoke County, in the southwestern part of the state, and on the Roanoke River. Lynchburg is fifty-four miles east, Richmond, the state capital, is 172 miles east, and Washington, D. C., is 227 miles northeast, by rail.

Roanoke is beautifully located in a natural amphitheater formed by the Blue Ridge Mountains to the east and the Allegheny Mountains to the west. The elevation of the city at the Norfolk & Western passenger station is 940 feet, but a mountain within the city reaches an elevation of approximately 2,000 feet. The summit of Mill Mountain is reached by a beautiful concrete highway. Crystal Spring is at the foot of the mountain.

The first white men who saw the site were Thomas Martin and John Sallings, who traveled through the Shenandoah Valley in 1726. "Big Lick," as the original hamlet was called, because of a large saline marsh where deer came for salt, grew about a stone house erected in 1797 by William Stover. In 1882 the settlement received its present name, and in 1884

it was chartered as a city. The city ranks third in the state, following Richmond and Norfolk. Population, 69,287 (Federal census of 1940).

Transportation. The Norfolk & Western and the Virginia railways enter the city, and interurban and motorbus lines are in operation to Vinton and to Salem.

Industry. In the beginning, Roanoke was a railroad town, but now, including its public-service companies, it has 170 industrial establishments employing approximately 20,000 people, with an annual pay roll of about \$29,350,000. Here is the home of one of the largest rayon-producing mill in the world, and of the largest structural-steel plant and the largest railroad-equipment and repair shops in the South. Many other articles are manufactured here, including tin cans, wearing apparel, gloves, flour, hard- and soft-wood products, furniture, foundry products, and cast-iron soil pipe.

Education. Within a radius of approximately eighty-five miles are more than twenty colleges and universities for the higher education of men and women. In Roanoke is the National Business College for men and women. At Salem, near by, is Roanoke College for men; and at Hollins, Hollins College for women.

B.F.M.

ROANOKE ISLAND. See DARE, VIRGINIA (The Lost Colony of Virginia).

ROANOKE RIVER, a waterway of North Carolina and Virginia. Some authorities apply the name to the stream formed by the union of the Dan and the Staunton rivers, and others consider the Staunton and the Roanoke to constitute one river, having the Dan as a tributary. If the latter view is taken, the river may be said to rise in the Blue Ridge Mountains in Southwestern Virginia, and to flow in a general southeasterly direction for 450 miles, emptying into Albemarle Sound. The Dan enters the stream at Clarksville, Va. At Halifax a dam has been built to supply the city with water power, and a canal has been cut around the dam to keep the river open to commerce. See NORTH CAROLINA (Rivers and Lakes).

ROARING FORTIES. See PREVAILING WESTERLIES.

ROARING MOUNTAIN. See YELLOWSTONE NATIONAL PARK.

ROASTING MEATS. See COOKERY.

ROBBERY. Three men armed with revolvers entered a bank during business hours, intimidated the employees by threatening to shoot them if they offered resistance, and took away with them several thousand dollars. Two men in an automobile met a farmer going to the city, overpowered him, and forcibly took one hundred dollars from him. All these men were arrested, tried, and convicted. Those who took the money from the bank were convicted of *robbery*; the others, of *highway robbery*, or robbery on a public street.

In criminal law, robbery consists in taking from a person by violence or intimidation money or goods to any value whatever. This

crime is classed as a felony, and is punishable by imprisonment. The value of the property taken has but little influence in determining the penalty, except that it must be of some value to the person from whom it was taken. In some jurisdictions, two degrees of this offense are recognized—simple robbery and robbery with a gun. The latter carries a heavier penalty, up to life imprisonment.

Entering a house through an open doorway with intent to steal is robbery, but breaking in at night is classed as *burglary*.

Related Subjects. The reader is referred in these volumes to the following articles:

Burglary	Crime	Felony
Courts	Criminology	Larceny

ROBBIA, *robb' byah*, DELLA, the name of a family of Italian sculptors who lived during the days of the early Renaissance.

Luca della Robbia (1399-1482) was born and died in Florence. He exercised his greatest influence as the founder of a school of sculpture in which the medium used was glazed or enameled terra cotta. "Robbia ware" became famous throughout all Europe. However, the secret of its invention never left the Robbia family, and after the death of the last member, no more was made. Luca della Robbia ranked with the best of his contemporaries in the production of beautiful forms, and he was distinguished for his work in marble and bronze, as well as for his reliefs in terra cotta. His Madonnas and saints made him the typical religious sculptor of his day. He designed and made ten panels of angels and dancing boys and a great bronze door, for the cathedral at Florence.

Andrea della Robbia (1437-1528), the nephew and pupil of Luca, made a much wider use of terra cotta and carried the art into the smaller towns. He adorned churches at Arezzo, Prato, Siena, and Florence, but only his earliest work embodies the dignity which always characterized the achievements of his uncle. His five sons continued the activities of the family, but they contributed nothing to the development of art.

ROBERT II. See SCOTLAND.

ROBERT BRUCE. See BRUCE, ROBERT.

ROBERT COLLEGE. See TURKEY (Education); CONSTANTINOPLE.

ROBERT OF LINCOLN. See BOBOLINK.

ROBERTS, SIR CHARLES GEORGE DOUGLAS (1860-), a poet and novelist, and one of Canada's most versatile men of letters. In his poems he shows imagination and artistic finish; in his novels he displays to excellent advantage his powers of description of natural scenery; and in his animal sketches he reveals a remarkable knowledge of animals.

Roberts was born at Douglas, near Fredericton, N. B., was educated at the University of New Brunswick, and made his home in that province and in Nova Scotia for many years. He lived in Toronto from 1883 to 1884 as editor of Goldwin Smith's newspaper *The Week*, and from 1885 to 1895 taught in King's College (Windsor, N. S.). At first he held the chair of

English and French literature, and later was professor of English and economics. In 1897-1898 Roberts was associate editor of the *Illustrated American*, published in New York. He saw service in the World War, and subsequently lived in England, but returned to Canada in 1927. He was knighted during the King's silver jubilee, 1935.

His Writings. *Ave: An Ode for the Shelley Centenary*, is usually considered his best poem. When he was twenty years old, his first published volume, *Orion and Other Poems*, appeared. In *Divers Tones*, *Songs of the Common Day*, *The Book of the Native*, and *New York Nocturnes* are other volumes of verse. Among his many novels and sketches are *The Raid from Beausejour*; *Around the Camp Fire*; *The Forge in the Forest*; *By the Marshes of Minas*, a volume of short stories; *The Heart of the Ancient Wood*; *The Kindred of the Wild*; *A Balkan Prince*; *Wisdom of the Wilderness*; *They Who Walk in the Wilds*; *The Secret Trails*; *Barbara Ladd*, an historical novel; the animal stories: *Neighbors Unknown*; *Feet of the Furtive*; *Hoof and Claw*; and *Red Fox*, the last his masterpiece in this field. Roberts also wrote an excellent one-volume *History of Canada*.

ROBERTS, FREDERICK SLEIGH, Earl of Kandahar, Pretoria, and Waterford (1832-1914), a British soldier known affectionately throughout the world as "BOBS," was born at Cawnpore, India. After receiving a thorough literary and military education, he won a commission in the Bengal artillery in 1851. For twenty-five years he served with the Indian army, becoming noted for his great military ability and genius in transporting and supplying troops, and became commander in chief in 1885. For gallantry in action at Khudaganj, he received the much-prized Victoria Cross. During his varied and efficient service in India, Roberts performed a remarkable and memorable march to Kandahar. With a force of 10,000 men, he marched 313 miles through hostile territory in twenty-two days, and on the twenty-third day, gained a complete victory over the rebels who besieged Kandahar, though his force was far outnumbered and had suffered terribly on the march. He was officially thanked by Parliament and created a baronet. For his further services while commander in chief in India, he was raised to the peerage as Baron Roberts of Kandahar and Waterford.

After the opening disasters of the South African War (Boer War), in which Lord Rob-

erts lost his only son, he was sent to Africa to take supreme command. Arriving at Cape Town in January, 1900, he quickly changed the aspect of affairs. War was carried into the enemy's country, Mafeking and Ladysmith were relieved, and Bloemfontein, Johannesburg, and Pretoria fell into the hands of the British. When, in its final stages, the struggle dwindled to guerrilla warfare, the command was handed over to Lord Kitchener, and Roberts returned to England. There he was awarded an earldom and a grant of \$500,000, and was made commander in chief of the British army.

At the outbreak of the World War, in August, 1914, Lord Roberts was frequently in consultation with the War Office, and when two Indian divisions arrived in France, he made a trip to that country to visit the men in the trenches. While he was at the front, he contracted pneumonia, and died on November 14. See SOUTH AFRICAN WAR.

ROBERTS, OWEN J. See SUPREME COURT.

ROBERTSON, JAMES, a Tennessee pioneer. See WATAUGA ASSOCIATION.

ROBERVAL, JEAN FRANÇOIS DE LA ROQUE (born 1500), one of the earliest French colonists and explorers in Canada. He sailed to the New World first in 1536, and in 1542 was commissioned lieutenant general, under the chieftaincy of Cartier. After arriving at Newfoundland and suffering incredible hardships from cold and starvation, he started for the interior. From that time all authentic record of him is lost. Some accounts state that he died at sea, while others assert that he was killed in Paris.

ROBESPIERRE, ro bes pyair', MAXIMILIEN MARIE ISIDORE (1758-1794), one of the most celebrated of the French Revolutionists, was born at Arras, France. He was educated in the college of Arras and the Collège Louis-le-Grand at Paris, and after studying law in the latter city, returned to Arras to begin a legal career. He speedily became known as a skilful advocate, a man of integrity, and the possessor of a nature so kind that in 1782 he resigned a position as criminal judge rather than pronounce a death sentence. He was an enthusiastic student of Rousseau, and at the approach of the French Revolution, thought he saw an opportunity to establish the ideal society which Rousseau had described. He therefore began to speak for the liberal democratic views then popular among the French middle classes, and when the States-General, or National Convention, met at Paris, in 1789, he was sent as a representative.

Robespierre had back of him the enthusiastic support of the Jacobins, who believed in severe measures toward royalty, and these partisans saw to it that the common people heard often about his speeches and deeds in their favor. He became bold, and bitterly opposed the policies of the Girondists, or believers in milder



Photo: Brown Bros.

LORD ROBERTS

measures toward the nobility. After the storming of the Tuileries, he was elected a member of the Commune of Paris, and his popularity with the common people gave that organiza-



Photo: Brown Bros.

ROBESPIERRE

The fate which he meted out to hundreds of Frenchmen overtook him.

tion the strength to carry out its decrees. Then came the trial of Louis XVI, on January 1, 1793, in which Robespierre stood firmly and successfully for the death sentence, and thus gained the friendship of the radical revolutionist Danton, just then rising to power.

In July, 1793, Robespierre was elected to the new Committee of Public Safety, and through its work gained ill fame which will doubtless follow him through all history. This committee resolved to crush all dissension at home, so that a united country might face its foreign enemies, and to this end the "Terror," or reign of the guillotine, was established. The accusation that Robespierre incited this period of violence is to some extent unjust. He had but two allies in the committee of twelve, and could not have dictated affairs. Moreover, whatever he permitted was for the purpose of ridding the country of the discontented, who might hamper the ideal society which he firmly believed was coming; while his companions on the committee saw in the wholesale butchery a thorough and rapid way of disposing of their own political enemies. Be that as it may, between June 10 and the death of Robespierre, July 28, 1794, this organization sent to the guillotine nearly 1,300 people.

Meanwhile, even his political allies began to fear his power, and the Committee of Public Safety decided to make him the scapegoat for

the butchery of the Terror. On July 26 he defended himself in such a forceful speech that the Convention voted to follow his suggestion of ceasing the wholesale execution, and placed no blame upon him for the record of the terrible weeks which had passed. The next day, however, his enemies rallied their forces and caused the Convention to declare him "outside the law," meaning, practically, an outlaw. During an attempt to arrest him, part of his jaw was torn away by a bullet, and in this horrible condition, he was brought before the Convention. Unable to defend himself, Robespierre was sentenced to the guillotine, and was executed the next day.

His private life was admirable, and his manners and tastes those of a gentleman. He was by nature a dreamer and an idealist, and only his oratory gained him his position as an executive.

Related Subjects. The following articles in these volumes will make clear certain references in this sketch of Robespierre:

Commune of Paris	Jacobins
Danton, Georges Jacques	Louis (XVI, France)
French Revolution	Mirabeau, Count de
Girondists	States-General
Guillotine	Tuileries



Each morning, when my waking eyes first see,
Through the wreathed lattice, golden day appear,
There sits a robin on the old elm tree,
And with such stirring music fills my ear,
I might forget that life had pain or fear,
And feel again as I was wont to do,
When hope was young, and life itself were new.

—WELLS: *The Old Elm Tree.*

ROBIN, a North American songster of the thrush family, called by John Burroughs "the most native and democratic" of American birds.

The robins are so sociable and are seen in such numbers around our dwellings that they have never attained the reputation enjoyed by some of the more secluded birds of the woodlands. Yet, as one authority has said, "Let the robin hide in distant forests and reveal himself to a lucky few only, and there would be no bird that could excel his beauty, dignity, or song." Robins are rather large birds, measuring about ten inches from beak to tail. Their plumage is attractive, the orange-red breast providing a striking contrast to the olive-gray upper parts, grayish wings, and black head. White markings are found on the throat and tips of tail feathers and below the tail. Except in the autumn, when male and female are much alike, the coloration of the female is duller than that of her mate.

These birds have a wide range, for they breed from Mexico to Alaska, and their winter migrations take them south to Guatemala. They are among the first birds to come back from the south, a fact which has given rise to the familiar sayings—"The robin has come and spring is here"; "Good luck to see him first on highest branch." In fall, robins linger in the northern states until November, and in years when the wild mountain-ash trees bear a large crop of berries, flocks of them have been seen north of Lake Superior in January. While the birds are mating, they fill the air in the morning and evening with joyous, ringing notes, which sound much like *cheerily, cheerily, cheerily*. Male and female labor together in building the nest, and a pair often returns to the same spot year after year. A favorite site is a crotch on a horizontal branch, or a ledge about a barn or house. The nest is fashioned into a cup-shaped mold of straw, rags, and paper, cemented with mud. Both birds share in the work of hatching the three to six blue eggs. There are usually two broods a season.

Robins are voracious eaters, and over half of their food consists of fruit. As they like wild berries better than the fruits of garden or orchard, the cultivated cherries and berries may be protected by the planting of wild shrubs and mulberries near by. Their food includes also large numbers of insects and worms, and for this reason they are an aid to the farmer. Robins are protected in the United States and Canada. See *BIRDS* (Protective Laws and Treaties; color plate, Birds Seen in the City).

The European robin, also called *redbreast*, is a much smaller bird than the American, and of more brilliant plumage. It too belongs to the

thrush family. According to an old English legend, this "pious bird with the scarlet breast" mercifully picked a thorn from the crown of Christ as He was on His way to Calvary, and as the bird carried it in its beak, the blood dropped from the piercing point to its breast, dyeing it red. D.L.

Scientific Names. Robins belong to the family *Turdidae*. The American species described above is *Turdus migratorius*. The European robin is *Erithacus rubecula*.

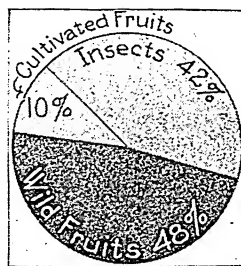
ROBIN GOODFELLOW. See *PUCK*; *BROWNIE*.

ROBIN HOOD, a very popular hero of English legend. The old ballads describe him as an outlaw, living with his yeomen in Sherwood Forest, in Nottinghamshire. He was the most virtuous and gentlemanly of outlaws, for he never molested or permitted his men to trouble poor travelers, or any company in which a woman was present. On the contrary, he often shared with the needy the spoils which he took from his wealthier victims, for no rich knight, and even more surely no rich clergyman, passed through his forest domains without being robbed. The outlaws lived an out-of-door life, depending for food on the supplies taken from travelers, and on the king's deer which they shot.

Whether or not such a character ever really lived has been a subject for much discussion. Scholars have written books which seemed to prove absolutely that Robin Hood did live, and which even gave the period of history when he flourished, but a rival scholar has also been able to advance very weighty arguments to show that he was not an historical character. Some authorities hold that the stories about him are in reality fairy stories, told about some woodland sprite, and that belief in his human existence grew out of this. The literature about him is extensive, for poems, stories, operas, and dramas have been built around his exploits. The old ballads which gave the original account of him date back to the beginning of the fifteenth century, but references in literature show that the tales were current before that time. One ballad series, *A Little Geste of Robin Hood*, forms one of the earliest ballad collections known, but it is evidently a compilation of earlier short poems.

In Literature and Drama. The famous outlaw has been much used as a character in modern writings: Scott introduces him as Locksley, in his *Ivanhoe*; Tennyson made him the central figure of a drama, *The Foresters*; Howard Pyle wove the old tales into his very successful *Merry Adventures of Robin Hood*; and Reginald De Koven the comic opera *Robin Hood*. A moving picture, with Douglas Fairbanks as Robin Hood, was produced in 1924; another in 1938, with an operetta version.

ROBIN HOOD OF SCOTLAND. See *ROB ROY*.



WHAT ROBINS EAT

ROBINSON CRUSOE, a story by Daniel Defoe, published in 1719. Though it is over two centuries old, it has never lost its popularity. It was founded on the adventures of Alexander Selkirk, who was shipwrecked on Juan Fernandez, 350 miles off the coast of Chile. The book gives a careful, circumstantial account of Crusoe's shipwreck and his method of life on an uninhabited island, whose location no one knows, and which is probably imaginary. It is one of the most fascinating boys' books ever written, and has been translated into various languages. See illustrations, page 6151; DEFOE, DANIEL.

Related Subjects. See JUAN FERNANDEZ (illustration of Selkirk Monument); SELKIRK, ALEXANDER.

ROBINSON, EDWIN ARLINGTON (1869-1935), American poet, born in Head Tide, Me. He attended Harvard University from 1891 to 1893. He settled in New York in 1900, and five years later his work began to attract wide attention. His poetry, which is both lyrical and philosophical, was awarded three Pulitzer prizes, for *Collected Poems* (1921); *The Man Who Died Twice* (1925); *Tristram* (1927). Other works are *Cavender's House*, *Talifer*, and *King Jasper*.

ROBOT, *ro' boht*. See TELEVOX.

ROB ROY (1671-1734), a famous Scottish outlaw whose adventurous career is known to every reader of Scott's novel, *Rob Roy*. His exploits are also the theme of a popular light opera by Flotow. Rob Roy is sometimes called the "Robin Hood of Scotland," for both names have romantic and legendary associations (see ROBIN HOOD). This Scottish outlaw was the son of Donald Macgregor of Glengyle. His mother was a Campbell, and he was given the Christian name of Robert. When the Macgregor clan of Glengyle was outlawed, the youth took his mother's family name, but he was always popularly known as Rob Roy. *Roy*, the Gaelic word for *red*, was applied to him because he had reddish hair and a florid complexion. He had a powerful physique, though he was not much above the average in height, and was widely known for his great strength and his skill in the use of the sword.

Having inherited land in the Highlands, Rob Roy began to raise cattle for the English markets, but he soon found it necessary to gather about him a band of armed clansmen to protect his herds from marauding outlaws. His own career of outlawry was the result of unwise speculations, for he was compelled to borrow money from his neighbor, the Duke of Montrose, and when the loan was not repaid, the duke evicted him from his property and placed him under the ban (1712). In desperation, Rob Roy organized a band of followers against the duke and his tenants, stealing both their cattle and their rent money. For a long time he evaded all attempts to capture him, but in 1722 gave himself up to the English au-

thorities. He was imprisoned and sentenced to be transported (1727), but was pardoned and permitted to return to Scotland. There he spent the rest of his life.

ROBSART, AMY. See LEICESTER, ROBERT DUDLEY.

ROBSON, ELEANOR. See BELMONT, AUGUST.

ROBSON, MOUNT, the second highest mountain in British Columbia, and the highest in the Canadian Rockies, is 13,068 feet in altitude. It belongs to that range of the Canadian Rockies which culminates in the region of the Athabaska and the North Saskatchewan rivers, and is situated not far from the boundary between British Columbia and Alberta. Mount Fairweather, the loftiest peak in British Columbia, is in the northwestern corner of that province. It is 15,290 feet in altitude. Both these peaks typify the rugged grandeur of the Canadian mountains. See CANADA (Physical Characteristics); ROCKY MOUNTAINS.

ROBUSTI, JACOPO, the real name of Tintoretto (which see).

ROC, *rok*, a huge bird of Arabian mythology, able to carry an elephant in its talons, and said to have dwelt in the vicinity of Madagascar. Sindbad the Sailor, in *The Arabian Nights' Entertainments*, came upon a roc's egg that was fifty paces round. When the roc appeared, her wings darkened the sun. Sindbad tied himself to one of her legs, as she sat over the egg, and was carried away. There is, needless to say, no foundation in fact for these stories.

ROCHAMBEAU, *ro shahN bo'*, JEAN BAPTISTE DONATIEN DE VIMEUR, Comte de (1725-1807), a French soldier who rendered valiant service under Washington in the Revolutionary War. He was educated for the Church, but adopted the military profession instead, entering the army in 1742. He distinguished himself in the War of the Austrian Succession, and in 1749 was appointed governor of Vendôme, his birthplace, in succession to his father. The Minorca Expedition in 1756 and the



Photo: Brown Bros.

COUNT ROCHAMBEAU

Seven Years' War in Germany (1756-1763) also added to his reputation, and in 1780, with the rank of lieutenant general, he was sent to America at the head of 6,000 French troops to assist Washington against the British. For a year his army was kept inactive in Rhode



Photos: Visual Education Service

From the Story of Robinson Crusoe. The illustrations, from left to right, present Crusoe viewing the wreck of his vessel, on a tour of exploration of his island, in his cave with his man Friday, and, finally, overcome by the prospect of deliverance.

Island, owing to the British blockade. In 1781, however, he joined Washington on the Hudson.

During the ensuing campaign, Rochambeau put himself under the orders of Washington and took part in the operations which culminated in the surrender of Cornwallis at Yorktown. For this service, he and his troops were voted the thanks of the nation, by Congress.

Returning to France in 1783, he was appointed governor of Picardy and Artois, and in 1791 was made a marshal of France. Although in sympathy with the Revolution, Rochambeau abhorred the excesses of the leaders. During the Reign of Terror, he was imprisoned and narrowly escaped the guillotine, but his rank and estates were restored to him by Napoleon.

ROCHDALE PLAN. See COÖPERATION (Consumer Coöperation).

ROCHE, ARTHUR SOMERS (1883-1935), an American novelist, probably the only writer of a book which inspired an executive to declare a legal holiday in its honor. He was born in Somerville, Mass., was educated at Holy Cross College, Worcester, and practiced law for a brief time. He entered newspaper work in 1906, and began writing magazine stories in 1910. In 1918, as captain, he commanded a military-intelligence division in the army.

Roche's Books. His first volume, *Loot*, appeared in 1916, and was followed by *Plunder*, *The Sport of Kings*, *Ransom*, *The Eyes of the Blind*, *Uneasy Street*, *Find the Woman*, *The Day of Faith* (see below), *A More Honorable Man*, *The Pleasure Buyers*, *Devil-May-Care*, *Come To My House*, and *What I Know About You*.

The Day of Faith inspired Governor Thomas C. McRae of Arkansas to declare November 1, 1921, a legal holiday in honor of the book. The day of faith was one on which every person all over the world was in perfect sympathy with every one else—a day of universal love, the beginning of the millennium. It was brought about by world-wide propaganda of a billionaire, but the world dropped back into its old ways, because of the man's insincere motives.

ROCHE, MAZO DE LA. See CANADIAN LITERATURE (English Canada).

ROCHELLE SALTS. See SALTS; SEIDLITZ POWDERS.

ROCHESTER, MINN. See MINNESOTA (back of map).

ROCHESTER, N. Y., the third largest city in the state, and the county seat of Monroe County. It is situated in the west-central part of the state, on both banks of the Genesee River, at its junction with Lake Ontario, 379 miles west of New York City, and sixty-nine miles east of Buffalo. The port of Rochester accommodates a great tonnage of incoming and outbound freight, as well as a large volume of passenger traffic. Population, 324,975 (Federal census of 1940).

General Description. Rochester occupies a broad, level plateau in the heart of the beautiful Genesee Valley. Three cataracts of the Genesee River fall within the city limits, affording enormous hydroelectric power. The harbor and warehouses of the New York State Barge Canal are also within the heart of the city. Rochester is advantageously located, not only for mercantile business, but for fruit-raising, for both east and west from the city stretches one of the richest fruit and truck-farming belts in the country. Within a short motoring distance lies the delightful Finger Lake region of Central New York, famous for its beautiful scenery. Rochester is justly entitled to the names by which it is variously known—"Flower City," "City of Homes," and "Kodak City," having adopted the last-named since the development of its great camera and photographic supply business.

Rochester is divided into two nearly equal parts by the Genesee River, which is spanned by twelve bridges, some of which are 212 feet high. There are many fine streets and boulevards, and the residential sections are especially attractive. The park system includes 1,862 acres; largest of the parks are the Genesee Valley Park and the Durand-Eastman, which has a four-mile frontage on Lake Ontario. Near-by Irondequoit Bay also affords recreation and amusement. To the south of the city lie the upper reaches of the Genesee, with its famous Portage Falls and Letchworth Park.

Transportation. Five steam railroads—the New York Central, the Pennsylvania, the Baltimore & Ohio, the Lehigh Valley, and the Erie—serve the city. Interurban trolley lines and motorbus lines connect with the neighboring towns and cities. The bed of the Old Erie Canal has also been converted into a municipally owned subway, designed to provide tracks for interurban passenger and freight service, as well as a belt line connecting with all the railways. Daily sailings of lake steamers afford trips to the Thousand Islands, Montreal, and Quebec, and also to Toronto, Cobourg, and Kingston.

Industries. Rochester's industrial area includes over 760 manufacturing concerns and is represented in fifteen of the sixteen major classifications into which the Bureau of the Census subdivides American industries. The city leads the world in the manufacture of photographic films, cameras, mail chutes, check protectors, thermometers, office equipment and systems, and enamel steel tanks. Approximately 90 per cent of the country's motion-picture film is manufactured here, and it is among the leading cities of the world in the manufacture of optical and surgical instruments. Here, also, is the headquarters of the nursery business of the country, which has given rise to the name "Flower City."

Education. The University of Rochester was entirely rebuilt upon a new site in 1935, and has in addition a School of Medicine and Dentistry. This improvement was made possible by a gift of \$4,000,000 from George Eastman of Kodak fame, and of \$5,000,000 from the General Education Board. The

Eastman School of Music, connected with the university, was also endowed by George Eastman; the beautiful Eastman Theater, donated by the same benefactor, and opened in 1922, is an adjunct of the School of Music; it is "dedicated to the enrichment of community life." Other educational institutions include a theological seminary (Baptist), Saint Bernard's Seminary (Roman Catholic), and Mechanics Institute.

History. The first buildings in Rochester were a sawmill and a grist mill, built by Ebenezer Allan. The place was incorporated in 1817 as Rochesterville, which, in 1834, became the city of Rochester. A city-planning bureau was created in 1917, and zoning ordinances were adopted in 1920. V.B.W.

ROCHESTER UNIVERSITY. See NEW YORK (Education).

ROCK is the solid portion of the earth's crust. The processes by which rocks were formed are described in these volumes in the articles listed below. The formation of rocks from molten material is still going on, and may be seen wherever active volcanoes throw out lava, which solidifies on cooling. The rock envelope of the earth contains nearly all the known chemical elements, though only eight of them enter into the composition of rocks in such proportions as to require being named. They are found in approximately the following proportions:

	PER CENT
Oxygen.....	46.25
Silicon.....	28.06
Aluminum.....	8.16
Iron.....	4.64
Lime.....	3.50
Magnesium.....	2.62
Sodium.....	2.63
Potassium.....	2.32

Silicon is the basis of all quartz rock; alumina (aluminum oxide) is the basis of clay, limestone, and lime; and magnesia (magnesium oxide) of all the ferro-magnesian minerals. Each of these substances is described under its title.

As used in geology, the term *rock* means any solid portion of the earth. Sand, gravel, and ice are rock to the geologist. The term *stone* is applied to small, detached portions of rock, though very large masses are usually called *rocks*. Rounded stones which have been shaped by the action of ice or water are called *boulders* or *pebbles*, depending upon their size. These are frequently found long distances from the mass of rock from which they were broken, having been transported by ice or water.

According to their formation, rocks are classified as *igneous*, *sedimentary*, or *metamorphic*; according to their composition, as *granite*, *marble*, *quartzite*, *slate*, etc. A.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Geology (with list)	Metamorphism
Glacier	Sedimentary Rocks
Igneous Rocks	Stratified Rocks

ROCK-A-BYE BABY. See LANGUAGE (Language Work in the Home).

ROCK ASPHALT. See ASPHALT.

ROCK CREEK. See WASHINGTON, D. C.

ROCK CRYSTAL. See QUARTZ.

ROCKEFELLER, an American family name that stands for brilliant achievements in the financial world. Three members of the family—two brothers and a son—are especially noteworthy; the elder brother, John Davison, was for years accounted the richest man in the world.

John Davison Rockefeller (1839-1937) was born in Richford, N. Y. In 1853 his family settled at Cleveland, O., and he went to high school there and joined the Baptist church. In

1859, with \$1,000 he had saved and \$1,000 borrowed from his father, he formed a partnership with M. B. Clark in the produce commission business. In 1862 the partners Clark & Rockefeller formed the firm of Clark & Andrews, petroleum refiners. In 1865, Rockefeller bought the business and organized the firm of Rockefeller & Andrews. The next year he joined his brother, William, and Samuel Andrews in establishing the firm of William Rockefeller & Company as well as the



Photo: Brown Bros.

JOHN D. ROCKEFELLER

firm of Rockefeller & Company. In 1867, their interests were merged as Rockefeller, Andrews & Flagler. The enterprise was incorporated in 1870 as the Standard Oil Company of Ohio. This firm absorbed many others and in 1882 the various properties were merged in the Standard Oil Trust. This trust was technically dissolved in 1892 and the constituent companies were later joined in the Standard Oil Company of New Jersey.

In 1896, John D. Rockefeller retired, but retained the title of president of the Standard Oil Company until by order of the United States Supreme Court it was dissolved in 1911 and the constituent companies were separated.

Rockefeller also owned iron mines and lumber tracts and had other large capital investments. After his retirement, he devoted the greater part of his time to philanthropic enterprises which he had been developing for many years. His gifts have been largely devoted to religious and educational purposes. On Christmas, 1919, Rockefeller gave \$100,000,000, one of the largest single gifts in the history of the world. Half was allotted to the General Education Board, and half to the Foundation.

He founded the Rockefeller Institute for Medical Research (which see) in 1901, and the Rockefeller Foundation (which see) in 1913. See STANDARD OIL COMPANY; see also page 6154, for a list of the respective amounts of the major philanthropic gifts of Rockefeller and his son.

John Davison Rockefeller, Jr. (1874-), son of John Davison Rockefeller (above), was born

in Cleveland. After his graduation from Brown University (1897), he became an associate of his father in business. Philanthropy and religious work have claimed much of his time and interest. Shortly after the World War, he donated \$1,000,000 for repairs and reconstruction in connection with the palaces at Versailles and Fontainebleau and the cathedral at Reims (which see). He also gave the funds for the restoration of Williamsburg, the colonial capital of Virginia.

William Rockefeller (1841-1922), brother of John D., Sr., was born at Richford, N. Y. After engaging in the produce commission business, he associated himself with his brother in oil-refining at Cleveland, and between 1865 and 1911, was in charge of the New York business of the Standard Oil Company of New Jersey.



Photo: Brown Bros.

JOHN D. ROCKEFELLER, JR.

Gifts of the Rockefellers. Below are listed the most important donations to philanthropic institutions by John D. Rockefeller and John D. Rockefeller, Jr.

Rockefeller Foundation.....	\$182,851,000
General Education Board.....	129,209,000
Laura Spelman Rockefeller Memorial..	73,985,000
Rockefeller Institute for Medical Research.....	59,931,000
University of Chicago.....	34,708,000
American Baptist Home Mission Society	6,994,000
American Baptist Foreign Mission Society.....	6,845,000
Y. M. C. A. International Committee..	2,295,000
New York Public Library.....	3,500,000
Metropolitan Museum of Art.....	2,000,000
American Museum of Natural History..	1,040,000
Jerusalem Museum.....	2,000,000
League of Nations Library.....	2,000,000
Hampton and Tuskegee Institute (Negro).....	3,500,000
Brown University.....	500,000
Harvard University (Fogg Museum)...	500,000
University of Chicago (Divinity school)	1,000,000
Woods Hole Biological Laboratory....	400,000
International Education Board.....	21,000,000
Other gifts.....	17,857,000
Total.....	\$552,115,000

ROCKEFELLER CENTER, a building development in New York sponsored by John D. Rockefeller, Jr. See illustration, page 4989.

ROCKEFELLER FOUNDATION, an organization founded by John D. Rockefeller, chartered under the laws of the state of New York in 1913, with the permanent purpose of "promoting the well-being of mankind throughout the world." Its present program is concerned with certain definite problems in the fields of medical science (chiefly mental health), natural science (certain fields of biology),

social science (social security and economic problems), the humanities (cultural appreciation and expression), and public health. Except to a limited degree in public health, the Foundation is not an operating agency. It contributes toward those activities of other institutions and organizations which give promise of advancing its objectives; and, in addition, it coöperates with governments in general public health activities and the study and control of certain diseases.

The program of the Foundation is administered, under the president, through a group of executive officers called directors. The principal office is in New York. In Europe, an office is maintained in Paris.

The original endowment of \$100,000,000 provided by John D. Rockefeller has been increased by his subsequent gifts to more than \$183,000,000. Both the income and principal of the Foundation's general fund, now amounting to more than \$153,000,000, are available for appropriation. From the date of its organization in May, 1913, the Foundation has made disbursements amounting to more than \$285,000,000. The resources and policies of the organization are controlled by a self-perpetuating board of unsalaried trustees. H.B.vanW.

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, one of the most important agencies of the present day devoted to the interests of humanity, its special field being the prevention and cure of diseases that afflict mankind. The Rockefeller Institute was incorporated in 1901 in accordance with a pledge made by John D. Rockefeller that he would advance \$200,000 to be used in preliminary work in medical research for the interest of "humanity and science." Subsequent gifts have brought the endowment close to \$40,000,000.

In 1904, in New York City, the original laboratory was opened, with Dr. Simon Flexner as director. In 1906 Central Laboratory was completed, and a hospital was opened in 1910. In 1914, a department of animal pathology was established in the country near Princeton University, to which was added in 1931 a department of plant pathology.

A board of trustees was established in 1910, and under the present organization the Institute maintains departments of the laboratories, the hospital, and animal and plant pathology, each under a director. The Department of the Laboratories deals with disease problems in their physiological, pathological, bacteriological, chemical, and physical aspects, using the experimental method. The Department of the Hospital studies disease as it actually appears in human beings. The Department of Animal and Plant Pathology, by means of observation and experiment, studies all aspects of diseases of animals and plants.

The Institute was organized for research

only, and has confined itself to investigating fundamental biological, physical, and chemical subjects. It coöperates with many other groups in practical investigation. Although most of the work is carried on in its own extensive buildings, occasionally the Institute conducts field expeditions for solution of special problems, or coöperates with various commissions investigating dangerous diseases all over the world.

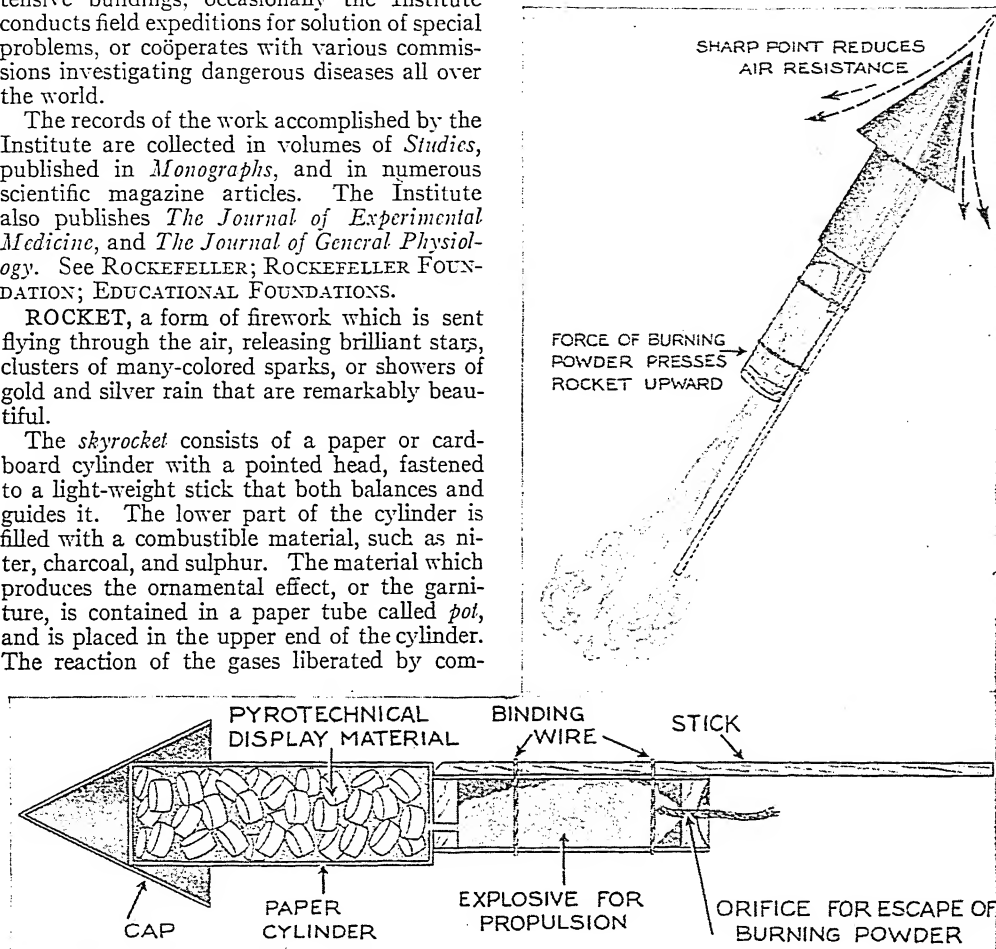
The records of the work accomplished by the Institute are collected in volumes of *Studies*, published in *Monographs*, and in numerous scientific magazine articles. The Institute also publishes *The Journal of Experimental Medicine*, and *The Journal of General Physiology*. See ROCKEFELLER; ROCKEFELLER FOUNDATION; EDUCATIONAL FOUNDATIONS.

ROCKET, a form of firework which is sent flying through the air, releasing brilliant stars, clusters of many-colored sparks, or showers of gold and silver rain that are remarkably beautiful.

The *skyrocket* consists of a paper or cardboard cylinder with a pointed head, fastened to a light-weight stick that both balances and guides it. The lower part of the cylinder is filled with a combustible material, such as niter, charcoal, and sulphur. The material which produces the ornamental effect, or the garniture, is contained in a paper tube called *pot*, and is placed in the upper end of the cylinder. The reaction of the gases liberated by com-

motion and thus keep their course straight. The cylinder is made of steel, with a cast-iron head.

A signal of distress at sea may be given by firing single rockets at short intervals. The



WHAT FORCES A ROCKET UPWARD? HERE IS AN ANSWER TO THE QUESTION

bustion is sufficient to project the rocket through the air, and as the rocket reaches its greatest altitude, the garniture is ignited by the flame which spurts through a hole from the lower section of the cylinder. There are also *winged rockets*, furnished with cardboard wings instead of a stick.

Rockets serve not only for ornamental fireworks, but for signaling, both in the army and in the navy, though radio has largely superseded rocket-signaling. Rockets are also used in warfare to set fire to ships and buildings, to frighten horses and thus throw mounted troops into disorder, and for projectiles. War rockets are not mounted on a stick, but have three vents in the bottom which set them in a rotary

life-saving service likewise employs rockets for carrying life lines, particularly where great range is needed, or in very rocky places which are dangerous for lifeboats to approach. See **FIREWORKS**.

ROCKET, THE, an early locomotive. See page 4076.

ROCKFORD, ILL., a manufacturing center and the county seat of Winnebago County, is situated near the northern state line, about midway between its eastern and western borders and on both banks of the Rock River. Chicago is eighty-five miles southeast; Dubuque, Ia., is ninety-five miles west and north; and Beloit, Wis., is eighteen miles directly north. Population, 84,637 (1940).

Rockford is known as the "Forest City," because of its magnificent old trees.

Transportation. The city is served by the Chicago & North Western, the Illinois Central, the Chicago, Burlington & Quincy, and the Chicago, Milwaukee, Saint Paul & Pacific railroads. There are bus and truck lines and a 140-acre airport.

Industry. Rockford is the second largest machine-tool producing center in the nation, and foremost in production of fine furniture. Other leading manufactures are hardware, knit goods, automobile accessories, agricultural implements, pianos, leather goods, packing boxes, and sewing machines.

Education. Besides public and parochial schools, and two business colleges, there is Rockford College. Founded in 1847, this liberal arts institution is the second oldest woman's college in the United States.

Rockford was settled by people from New England in 1834, plotted in 1836, and became a city in 1852. During World War I, thousands of soldiers were trained at Camp Grant, south of the city. It became a medical replacement and reception center during World War II. C.E.P.

ROCKFORD COLLEGE. See **ROCKFORD**.

ROCK FROTH. See **PUMICE**.

ROCK ISLAND, ILL. See **ILLINOIS** (map).

ROCKNE, KNUTE KENNETH (1888-1931), an American football coach. Born in Voss, Norway, he came to the United States in 1893. Entering Notre Dame University at the age of twenty-two, he distinguished himself in chemistry and as a football star. He graduated with a B.S. degree in 1914, and remained as a

chemistry instructor and assistant football coach. In 1918 he became head coach, continuing in this position until his untimely death in an airplane crash. Known as the greatest of all football coaches, Rockne was famous for his insistence on good sportsmanship and character, and his ingenuity in football strategy. His screen biography, *Knute Rockne—All American*, was a motion-picture highlight of 1940.

ROCK OF AGES (hymn). See **HYMNS AND HYMN TUNES**.

"ROCK OF CHICKAMAUGA," See **THOMAS, G. H.**; **WAR OF SECESSION** (Principal Battles).

ROCK OIL. See **PETROLEUM**.

ROCK RIVER, a river about 325 miles long, which rises in the southern-central part of Wisconsin, flows southwest, and joins the Mississippi near Rock Island, Ill. It has swift rapids, and furnishes excellent water power. The country through which the river flows contains much picturesque scenery. At Janesville there is a huge rock jutting into the water, on which Black Hawk (which see) is said to have made his last speech to the Indians.

ROCK SALT. See **SALT**.

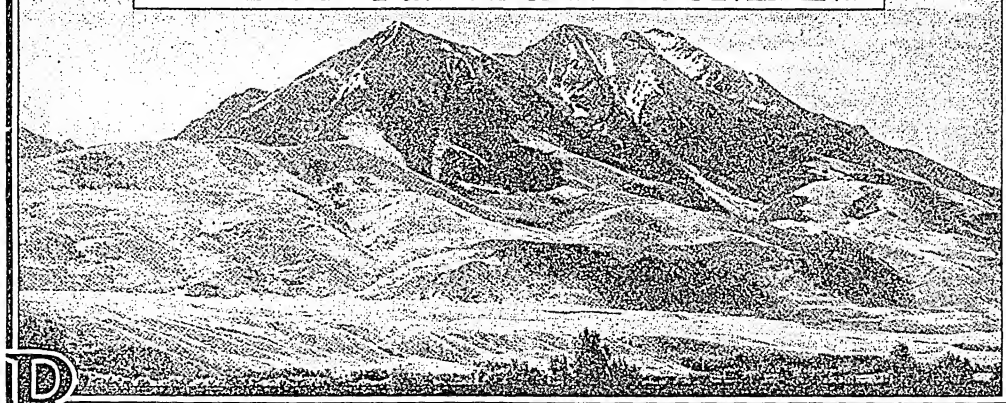
ROCK SPHERE. See **EARTH** (Parts).

ROCK SYSTEMS AND GEOLOGIC ERAS. See **GEOLOGY** (Divisions of Geologic Time).

ROCKY MOUNT, N. C. See **NORTH CAROLINA** (back of map).

ROCKY MOUNTAIN NATIONAL PARK. See **PARKS, NATIONAL**; **ROCKY MOUNTAINS**.

The Story of the ROCKY MOUNTAINS



ROCKY MOUNTAINS. Most of us, when we think of the Rocky Mountains, picture to ourselves the whole western edge of North America, from the point where the first peaks tower above the Great Plains to the abrupt shores of the Pacific. We may also consider the Rockies as the North American half of the Cordilleran chain, which extends from Cape Horn to the Arctic Circle, and of which the Andes form the South American half. But geographers, when they refer to them, in-

clude in the Rocky Mountains only the easternmost range of the northern Cordilleras, the wall of granite which begins near Vera Cruz, in Mexico, and passes north and west through Texas, New Mexico, Colorado, Utah, Wyoming, Idaho, Montana, Alberta, British Columbia, and the Yukon to Alaska. They do not include the western Sierra Madre in Mexico, the Sierra Nevada, Cascade, and Coast ranges in the United States, nor the Coast, Gold, and Selkirk mountains in Canada.

In Mexico. At their southern end, the Rocky Mountains touch the eastern coast of the continent, their steep slopes rising almost directly out of the Gulf of Mexico. Here in the tropics is the tallest peak in all the Rockies, the snow-tipped cone of Orizaba, whose summit is more than 18,000 feet above the near-by sea. North of it the range marks the eastern boundary of the great Mexican plateau; it is low, and is broken in many places.

In the United States. The engineers of the first railroad to the Pacific, searching for a place where they could carry their tracks across the Rockies without encountering heavy grades, found in the southern part of Wyoming a plateau over 250 miles long and 100 miles wide running through the mountains from east to west at a height of 7,000 feet. This plateau, called the Laramie Plains, divides the Rockies of the United States into two distinct parts. To the south of it comes first the highest and broadest section in the whole Rocky Mountains system, covering Colorado and Eastern Utah; then come the lower and less compact ranges of New Mexico and Texas. In Colorado there are fifty-one named peaks over 14,000 feet high; in Utah and New Mexico, ten exceed 13,000 feet; and in Texas, one mountain, El Capitan, is 9,020 feet in height. Above the Laramie Plains the Rockies extend toward the northwest, and are narrower and slightly lower. Wyoming has half a dozen peaks more than 13,000 feet high, but Idaho and Montana have each only one summit above 12,000 feet. Within the United States the Rocky Mountains system attains its greatest breadth, more than 1,000 miles.

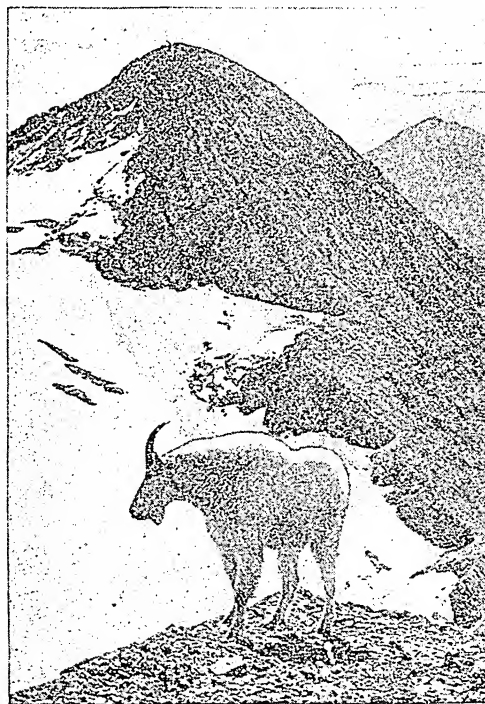
The Canadian Rockies. Sometimes people who have never before seen mountains exclaim with disappointment, after passing through the Rockies, that mountains were not at all what they had expected. Such a feeling is aroused by the fact that usually where the tallest peaks are, there also are the highest plains and plateaus. If these plains surround a mountain at half its height, its visible mass is only about one-eighth as great as if it rose directly out of the sea. In the Canadian mountains, travelers find all their dreams of the Rockies fulfilled. There are dozens of peaks more than 11,000 feet high, several more than 12,000, and one, Mount Robson, over 13,000 feet high; yet the Canadian Pacific Railway crosses the Continental Divide at an altitude of only 5,332 feet; and the Canadian National, when at its highest point, at Lucerne, about thirty miles from Mount Robson, is only 3,650 feet above the sea. The principal peaks of the Canadian Rockies are in British Columbia, and toward the north the range gradually decreases in height until, at the Arctic Circle, it is only a series of hills. Some of the finest scenery is included in national parks.

What Made the Rockies. The Rocky Mountains are too long a chain to be alike throughout their length. In general, of course, their existence is due to pressure from east and west by the mighty forces of nature, which have lifted to this continental backbone rocks containing skeletons of animals that once lived in the sea, and other rocks formed by the intense heat of the earth's interior. In the southern half, some of the mountains were once volcanoes, and evidences of volcanic activity are found in the huge lava sheets of Montana and Idaho and the geysers of Yellowstone National Park. But the shape of the Rockies, as we now see them, is the work of nature's never-resting carvers, the wind, the rain, and, from Colorado northward, the glacier. It is they that have hollowed out the valleys and worn away the softer layers of rock, revealing to geologists the history of the mountains and exposing to prospectors and miners rich treasures in gold, silver, copper, and coal.

[Throughout these volumes will be found views of peaks in this great range. For example, see articles DENVER, LOGAN, RAINIER, SHASTA, and so forth.]

ROCKY MOUNTAINS PARK, now called **BANFF NATIONAL PARK**. See **PARKS, NATIONAL** (Parks of Canada); **BANFF**; **LOUISE, LAKE**.

ROCKY MOUNTAIN GOAT, a habitant of the high snow-clad summits of the Canadian



ROCKY MOUNTAIN GOAT

and American Rockies. It is also found in Alaska. The Rocky Mountain goat is a mem-

ber of the goat-antelope family. It has a snaggy coat of long, white hair, slender, backward-curving black horns, a long head, humped shoulders, and small black hoofs. It is about three feet high at the shoulders. The animal lives for the most part high above the timber line, midst snow and glaciers, where its white coat is an excellent protection. It feeds on mosses and grasses. See ANTELOPE. W.N.H.

Scientific Name. The Rocky Mountain goat is *Oreamnos montanus*, a member of the family *Bovidae*.

ROCKY MOUNTAIN SPOTTED FEVER, a serious disease, often fatal, transmitted to humans by the bite of a species of wood tick.

ROD. See WEIGHTS AND MEASURES; DENOMINATE NUMBERS.

RODEO, a public entertainment presenting the features of a roundup, such as lariat throwing, horse breaking, and roping and branding of cattle. Rodeos are often historical in the West, combined with frontier pageantry.

RODENTS, or **RODENTIA**, *ro den' shik ah*, an order of mammals whose distinguishing characteristic is the possession of teeth especially adapted for gnawing. These teeth are large, curved, deeply rooted incisors, and there is one pair in the front of each jaw (pikas and rabbits have four upper incisors). These teeth are peculiar in that they grow continuously from the roots, but wear away at the tips; as the front surfaces alone are protected by enamel, the teeth wear faster at the back, and so a sharp, chisel-like edge is developed. For this reason, these animals can gnaw through very hard substances. Canine teeth are totally absent.

Rodentia show variation in size; the smallest rodent is the mouse, and the largest the capybara, a South American aquatic animal that grows to be four feet long. In habits there is even greater variety, for some live in burrows, as gophers, prairie dogs, and marmots; some have nests in the woodlands and meadows, as field mice; some live in trees, as squirrels; and the muskrats and beavers can live in water. One kind of squirrel sails through the air in a manner resembling the gliding of birds. Most rodents are covered with fur, but the porcupine has a covering that is truly a "coat of mail," for mingled with the coarse hairs on its back and sides are numerous stiff, barbed spines. Rodents are found in most parts of the world, and constitute the largest order of mammals. W.N.H.

Related Subjects. The most important of these animals, are described in these volumes. A list follows:

Agouti	Ground Hog	Muskrat
Beaver	Guinea Pig	Pika
Chinchilla	Hamster	Porcupine
Chipmunk	Hare	Prairie Dog
Deer Mouse	Jerboa	Rabbit
Dormouse	Lemming	Rat
Flying Squirrel	Marmot	Squirrel
Gopher	Mouse	Vole

RODERICK, Visigothic king of Spain whose reign during 710-711 is shrouded in legend. The Moslem invasion began when he was defeated by Tarik at Algeciras. See GOTHs.

RODIN, *ro daN'*, AUGUSTE (1840-1917), the greatest French sculptor of his age. His theory that nature should be the artist's one source of inspiration, and that only those creations which possess no character are ugly in art, was con-



"THE THINKER"

One of the most celebrated of modern works of art, by Rodin.

sistently applied throughout his career. Rodin was born in Paris, and in that city received all of his not very extended schooling. His genius flowered early, as one of his finest pieces, a head entitled *Broken Nose*, was modeled when he was only twenty-four. For several years after the Franco-German War, during which he was a member of the National Guard, he worked and studied in Brussels.

Rodin's famous *Age of Bronze*, which created a sensation because of its daring realism, was exhibited in 1877 in the Paris Salon. Then followed a bust of Saint John, now in the

Metropolitan Museum of Art (New York), *Saint John Preaching*, *The Thinker* (see accompanying illustration), *Adam and Eve* (also in the Metropolitan), the monument to the six *Bourgeois de Calais*, *The Kiss*, the *Danaid*, the *Bather* (Metropolitan), and many other works, including busts of several noted men. In 1914, when the war in Europe broke out, Rodin's studio was taken over by the government and converted into a day nursery. The aged sculptor, finding no haven in troubled France for creative work, went over to London. As a token of his appreciation of the kind welcome accorded him by the English people, he presented to the Museum of Victoria and Albert twenty of his finest pieces of sculpture. His former studio in Paris has been converted into an art museum, and here many of Rodin's masterpieces may be seen.

RODRIGO, the real name of the Cid (which see).

ROE, EDWARD PAYSON (1838-1888), an American novelist and clergyman, born in Orange County, N. Y. He served as a chaplain during the War of Secession, and then held the Presbyterian pastorate at Highland Falls, N. Y. Resigning this, he moved to Cornwall-on-Hudson, where he devoted himself to lecturing, writing, and fruit culture.

His Novels. He wrote a number of novels that were very popular in their day, but none of which possesses any special literary merit. The best-known of these are *Barriers Burned Away*, *Opening a Chestnut Burr*, *From Jest to Earnest*, *Near to Nature's Heart*, *He Fell in Love with His Wife*, and *The Earth Trembled*. These are all written in a moralizing vein, but have sufficient plot to hold the reader's interest.

ROEBUCK, *ro' buk*, also called **ROE DEER** and **ROE**, a European member of the deer family, one of the smallest of that race. It is a graceful, agile animal, with a long neck, slender legs, and a very short tail. Its summer coat is fox-red above and white beneath, but in winter this changes to a grayish-fawn color,

with a white mark on the rump. The male is about twenty-seven inches high at the shoulder, and has upright antlers with two main forks. Roe deer are still found wild in sparsely settled regions in the temperate parts of Europe, but are far less abundant than formerly. Both males and females are called *rocs*. W.N.H.

Scientific Name. The roebuck belongs to the family *Cervidae*. Its scientific name is *Capreolus capreolus* (or *caprea*).



THE ROEBUCK

ROENTGEN, *run't' gen*, **RAYS**, OR **X-RAYS**, are waves of radiant energy that have the remarkable power of penetrating substances opaque to ordinary light rays. The name *Roentgen* was given these rays in honor of their discoverer. Roentgen (German form RÖNTGEN) himself called them *X-rays*, because he did not understand their nature. He discovered them while experimenting with Crookes tubes, an early form of vacuum tube in which cathode rays are generated.

X-rays are very short electromagnetic waves produced by the impact of electrons, or cathode rays, usually on a heavy block of metal, called the target. They are generated in various types of glass bulbs, the most efficient of which is the tube invented by Dr. W. D. Coolidge of the General Electric Company. The original Coolidge tube is a bulb in which a nearly perfect vacuum has been produced, near the center of which there is a small tungsten filament heated to incandescence by an electric current. Opposite to and a few centimeters from the filament there is a cold tungsten target. The electrons, or cathode rays, emitted from the filament when heated white hot, are given an enormous velocity by means of a high potential discharge. Through the aid of a focusing device, the electrons are concentrated on a small central area of the target, generating rays which have very great penetrating power. Intense heat developed by the impact of speeding electrons is neutralized by water-cooling or some other method equally effective.

X-rays are practically of the same nature as light rays, except that they have much shorter wave-lengths, and the wave trains are



Photo: Brown Bros.

RODIN

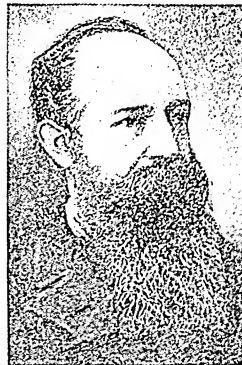
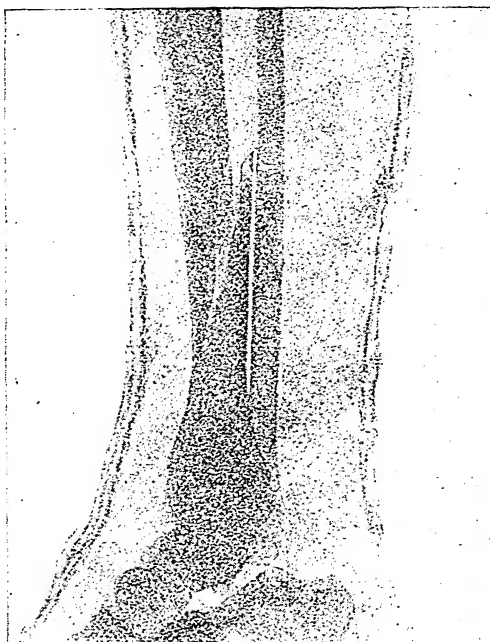


Photo: Brown Bros.

E. P. ROE

very short—more like pulses. X-rays are *not* reflected cathode rays, but electromagnetic waves produced by cathode rays striking matter and causing it to radiate. In the general spectrum, they lie far beyond the ultra-violet rays. The most penetrating X-rays, which are the high-frequency "hard" rays, can readily pierce flesh and other substances of



PICTURING A BROKEN BONE

low density, and even enter a short distance into lead. An apparatus devised by Dr. Coolidge in 1926 produces X-ray effects in the air outside of the device in which the radiations are generated. The Coolidge vacuum tube is about thirty inches long. In its center there is a bulb eight inches in diameter, and at one end of the tube there is an air-tight nickel window five ten-thousandths of an inch thick and three inches in diameter. A small electric-light filament in the middle of the bulb is subjected to a voltage of 350,000, which produces cathode rays that rush out of the nickel plate at a speed of 150,000 miles a second. The effects of these rays are discernible as far as two feet in front of the window. They turn castor oil into a solid; color white potassium chloride purple; and kill insects and bacteria after an exposure of a tenth of a second. On a rabbit's ear, exposed for a second to the rays, a scab formed which fell off, taking the hair with it. Two weeks later a thicker and longer growth of snow-white hair appeared on the spot. The practical uses of the Coolidge tube remained to be demonstrated until July, 1929, when the first commercial use for the cathode

rays produced by that tube was found. It was discovered that imitation sapphires could be almost instantly spotted among genuine stones when both were exposed briefly to the rays. All imitations, and all but one kind of genuine stone, glow as if molten; but as soon as the rays are shut off, the real sapphires lose the artificial glow, while imitations continue for some time to resemble live coals in color and appearance, though they remain cold to the touch.

There are but two forms of electromagnetic radiations having greater penetrating power than the hardest X-rays. These are the *gamma* rays emitted by radioactive substances, which can penetrate twenty centimeters, or nearly eight inches of lead, and *cosmic* rays generated in space, which are capable of penetrating as many as eighteen feet of the solid metal. They are treated in their proper place in these volumes.

Uses of X-rays. The most valuable uses of these radiations are found in the field of surgery and medicine. The rays penetrate such substances as flesh, clothing, and plaster of Paris, but are partially stopped by bone, metals, pus, and dense tissue. The shadow pictures taken by the X-ray apparatus reveal bone fractures, diseased joints, body tumors, and other growths, diseased conditions of the



MAKING AN X-RAY OF A TELEPHONE POLE

Note that the photographic plate is on one side and the X-ray tube in the box on the other side of the tree. An X-ray photograph is really a shadow-graph.

intestinal tract, incipient tuberculosis of the lungs, stones of the kidney and gall bladder, abscesses of the teeth, and many other pathological conditions. Thus X-rays are invaluable in the diagnosis of disease and the location of injuries. During the World War, they proved their worth in the detection of bullets

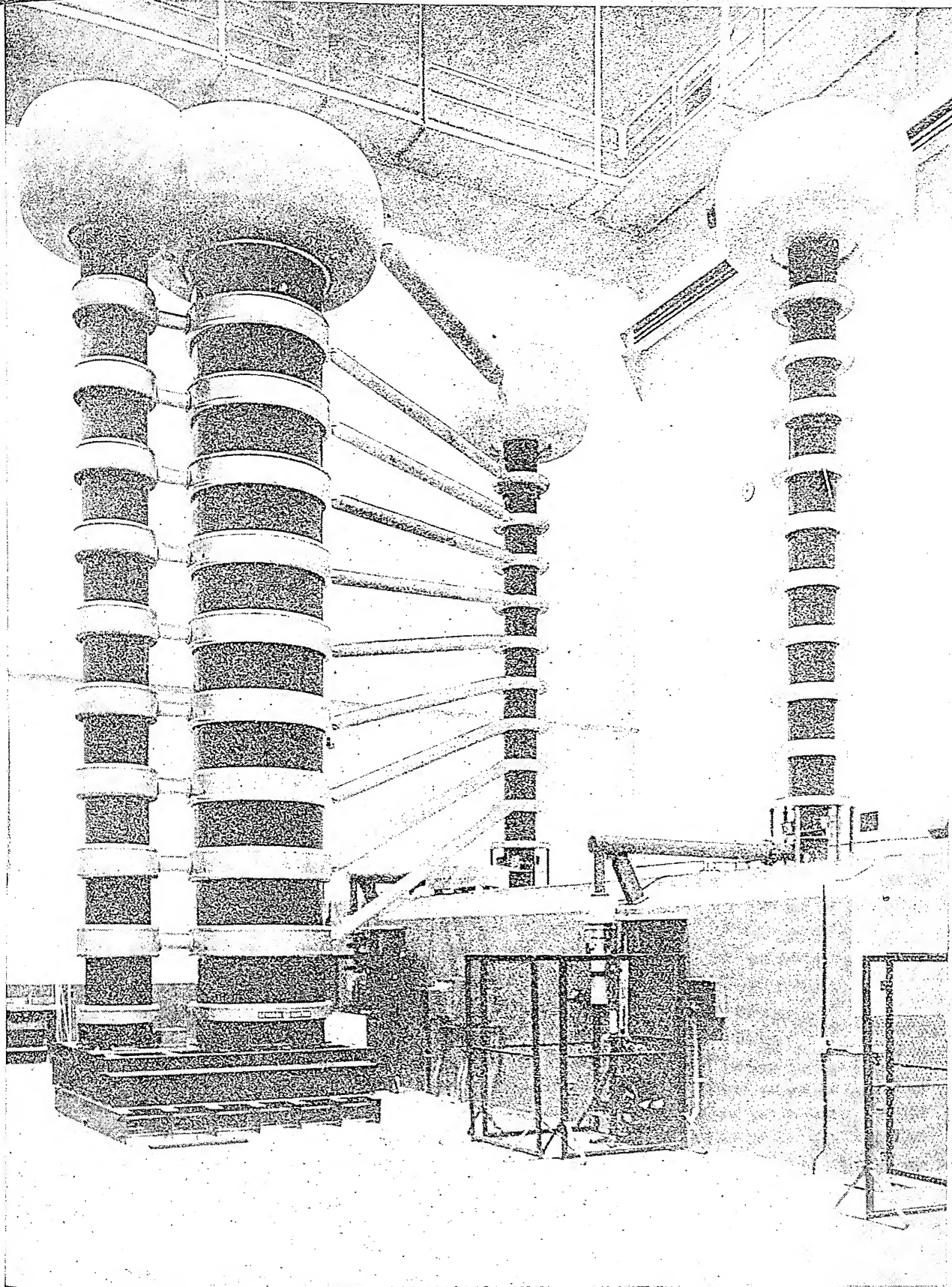


Photo: General Electric

LARGEST X-RAY MACHINE IN THE WORLD

Installed at the United States Bureau of Standards in Washington, D. C., this powerful machine generates a voltage of 1,400,000, producing X radiation about equal to that of fourteen pounds of radium.

and shell fragments, and were an indispensable aid to the surgeon who made over scarred faces. In hospitals, everywhere, X-rays are used to locate objects swallowed inadvertently, especially by small children. Their curative effects are best revealed in the treatment of skin affections and nervous diseases. Physicians report that the radiations will cure malignant growths, if used in time.

In the industrial world, X-rays are used to reveal defects in materials, to prove the quality of welding in airplanes and other machines, and to test timber, and they are of practical assistance in rubber-making, in the manufacture of optical glass, in electrical engineering and in many other branches of commerce and industry. Scientists are using them in studying atomic and crystal structure.

A.L.F.

William Konrad Roentgen (1845-1923), the discoverer of X-rays, was born at Lennep, Prussia. After intensive study at the University of Zurich, he became professor at Hohenheim, Strassburg, and Giessen, and in 1885 was appointed to the chair of physics at Würzburg. Here, in 1895, he announced his discovery of the new form of radiation, thereby becoming world-famous. For this achievement he was given the Order of the Royal Crown by the German emperor, and the title of baron by Prince Ludwig of Bavaria. In 1900 Columbia University awarded him the Barnard Medal for the greatest discovery in science during the preceding five years. He was also awarded the Rumford Medal of the Royal Society of London, and in 1901 the Nobel prize in physics.

Related Subjects. The reader is referred in these volumes to the following articles:

Cancer	Light
Cathode Rays	Radioactivity
Cosmic Rays	Tungsten
Crookes Tubes	Ultra-Violet Rays
Electricity	

ROGATION, *ro ga' shun*, DAYS, in the Roman Catholic Church, the Monday, Tuesday, and Wednesday before Ascension Day (which see). On these days, prayers known as the *litanies* are appointed to be sung or recited by the priests and people, often in public procession. The week in which the days occur is sometimes called *Rogation Week*. The name comes from the Latin *rogare*, meaning *to ask*, and the equivalent Greek word means *litany*. See LITANY.

J.A.R.

ROGER DE COVERLEY PAPERS. See ADDISON, JOSEPH.

ROGERS, JOHN (1829-1904), an American sculptor who became widely known for his clay models of groups representing typical scenes in American life and history. Of his many popular statuettes, none is a greater favorite than his *John Alden and Priscilla*.

[The reader will find a reproduction of this attractive piece of work in connection with the article *COURTSHIP OF MILES STANDISH*.]

Other popular pieces are his *Charity Patient*, *Going for the Cows*, and *The Town Pump*.

Rogers was born at Salem, Mass. His art studies were pursued in Rome and in Paris, and his first work of importance was the *Slave*

Auction, exhibited in America in 1860. Several war groups followed, including the *Picket Guard* and *Union Refugees*. In some of his historical statuettes will be found portrait studies of Lincoln, Grant, Whittier, and other famous men. Many of his clay figures have been copied in bronze, and he used this metal for his more elaborate figures, notably an equestrian statue of General Reynolds, in front of the Philadelphia city hall. The Metropolitan Museum in New York City possesses several good examples of his groups in bronze.

ROGERS, RANDOLPH (1825-1892), an American sculptor, famed for his memorial and symbolic monuments. He designed and modeled the bronze doors for the Capitol at Washington, which illustrate in relief the life of Columbus; he executed a great statue of Lincoln for Philadelphia; a statue entitled *Genius of Connecticut* for the capitol building in Hartford; a colossal *America* for Providence, R. I.; a figure representing *Michigan* for Detroit; and the figures of Marshall, Mason, and Nelson for the Richmond (Va.) Washington Monument. His *Nydia, the Blind Girl of Pompeii* (Art Institute, Chicago), and the *Boy with Dog* won him wide popularity.

Rogers was born at Waterloo, N. Y., but passed his boyhood in Ann Arbor, Mich. He studied art in Rome under Lorenzo Bartolini and other sculptors, and from 1855 until his death, he lived in Italy. The University of Michigan possesses a complete collection of casts of his works.

ROGERS, ROBERT. See OREGON (History: Exploration and Early Settlement.)

ROGERS, WILL (1879-1935), an American actor and humorist. On the stage, in a slow, drawling voice, he made shrewd, homely com-

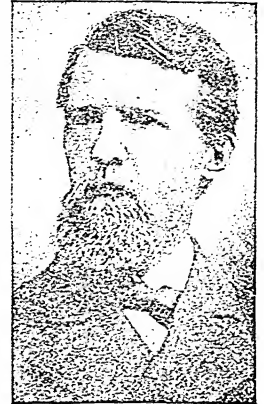


Photo: Brown Bros.

JOHN ROGERS

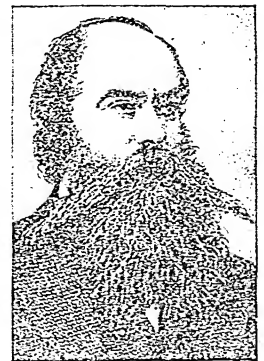


Photo: Brown Bros.

RANDOLPH ROGERS

ments on men and events. His humor was essentially American. Many newspapers syndicated his timely remarks in brief paragraphs which were widely quoted. His wit was enjoyed in magazine articles and in books. In 1927 his



Photo: Fox

WILL ROGERS

countrymen laughed over his *Letters of a Self-Made Diplomat to His President* and *There's Not a Bathing Suit in Russia*. But it was on the stage that he was at his best, whether he was twirling a rope in the Ziegfeld *Follies* or "pinch-hitting" for Fred Stone. In 1928, after Rogers had supposedly retired from the stage, he came to the rescue of his old friend, Fred Stone, who had been injured in an airplane

accident, and took over Stone's part in *Three Cheers*, a musical production.

Will Rogers was born on a ranch between Oologah and Claremore, Okla. He was educated at Kemper Military Academy in Boonville, Mo. In 1905 he made his first stage appearance in New York City. After a few years in vaudeville, he was with Ziegfeld's *Follies* for about fourteen years, except for three years in motion pictures. He became a star in talking pictures. In 1934 he made his first appearance in a legitimate play as star in the Pacific Coast production of Eugene O'Neill's *Ah, Wilderness!* He was killed (1935) in an airplane crash near Point Barrow, Alaska, on a flight with Wiley Post.

Several memorials have been erected in his honor. These include the Will Rogers Memorial Hospital at Saranac, N. Y.; the Will Rogers Memorial at Claremore, Okla.; and the Will Rogers Shrine of the Sun near Colorado Springs, Colo. His statue was placed in Statuary Hall of the national capitol at Washington.

His other works include *The Illiterate Digest* and a series of several *Rogerisms*.

RÔGET, PETER M. See MOVING PICTURES.

ROGUE RIVER. See OREGON (Rivers).

ROHLFS, *rohlfs*, ANNA KATHARINE GREEN (1846-1935), an American writer of popular mystery stories. She was born in Brooklyn, N. Y., and educated in Buffalo, N. Y., and in Ripley Female College, Poultney, Vt. She married Charles Rohlf, an actor, in 1884. Her short stories began to appear in magazines while she was still a schoolgirl, and her first novel, *The Leavenworth Case*, was published when she was thirty-two years old. This book is a detective story similar to the famous Sherlock Holmes stories of Conan Doyle, and

is still admired for the ingenuity of its plot and for the skill shown in establishing a case against a criminal by bits of insignificant circumstantial evidence. It was very successfully dramatized.

Other Stories. Mrs. Rohlf's other narratives include *The Sword of Damocles*, Marked "Personal," *The Millionaire Baby*, *The Woman in the Alcove*, *The House of Whispering Pines*, *The Mayor's Wife*, *Three Thousand Dollars*, *The Golden Slipper and Other Problems for Violet Strange*, *Mystery of the Hasty Arrow*, and *The Step on the Stair*.

ROHLFS, CHARLES. See above article.

ROJESTVENSKY, *ro jest ven' ske*, (Russ. ROZHDESTVENSKY), ZINOVY PETROVICH (1848-1909), a Russian naval officer, commander of the Baltic fleet which, during the Russo-Japanese War, was defeated in the great Battle of the Sea of Japan by the Japanese, on May 27 and 28, 1905. He fought in the Russo-Turkish War of 1877-1878, and took part in the Chino-Japanese War (1894) as second in command to General Alexeiev. He was made rear admiral in 1902, and commander of the Baltic fleet in 1904. In



Photo: Brown Bros.

ROJESTVENSKY

October, 1904, while conducting this fleet to Vladivostok, during the Russo-Japanese War, he incurred the wrath of England by firing on some British fishermen whom he mistook for the enemy, on the Dogger Bank in the North Sea. As a result of the incident, Russia was for several days on the verge of war with England. The well-prepared Japanese commander, Togo, met the Russian fleet in home waters, and on May 27, a great naval battle began near the Tsushima Islands, in the Sea of Japan. In a two-days' fight, nearly the whole Russian fleet was captured or sunk. Rojestvensky was wounded, but was rescued, and, together with over 4,000 of his men, was captured by the Japanese. On return to Russia, he was court-martialed but acquitted.

A.P.

ROLAND, *ro' land*, a celebrated hero of French romances of chivalry, known in Italian romances as ORLANDO. According to the generally accepted legend, he was the nephew of Charlemagne, in whose army he fought against the Saracens in Spain. When the army crossed the Pyrenees into France, Roland remained behind with the rear guard, and at Roncesvalles, where he was set upon by the Saracens, he was defeated and killed. His friend Oliver besought him, in the early stages of the battle, to blow a blast upon his horn and bring the forces of Charlemagne to his aid, but he refused; and only with his last breath did

he sound the call. Charlemagne heard it, turned back, and overthrew the Saracens. The *Song of Roland*, in which this story is told, dates from the eleventh century and ranks as a masterpiece. It was translated into English, German, Italian, Norse, and other languages, and formed the basis of many tales.

ROLAND DE LA PLATIERE, *ro lahN' deh lah plah tyair'*, MADAME [MANON JEANNE PHILIPON] (1754-1793), a Frenchwoman, daughter of an engraver, who became very prominent during the early years of the French Revolution, and was one of the most notable martyrs of that terrible period. She was born in Paris, and in a convent there was given the beginnings of an education. Her real education came, however, from her reading after she left school. As a child she read Plutarch, but in later years, Rousseau's teaching became her gospel.



Photo: Brown Bros.

MADAME ROLAND

In 1780 she was married to Jean Marie Roland de la Platière, and from the first she exercised a strong influence in his affairs, almost surpassing him in knowledge, wisdom, and tact. After the outbreak of the Revolution, they removed from Lyons to Paris, where their home became the meeting place for many of the leaders of the popular party. Among the visitors to her famous salon in Paris was Robespierre, who was to lose his life in the Reign of Terror. In 1792 Roland became Minister of the Interior, and much that was excellent in the administration of his office he owed to his wife.

When the downfall of the Girondists came, Madame Roland continued to uphold their cause, but in June, 1793, she was arrested and thrown into prison, where she spent the time in writing her *Mémoires*. In November she was executed. Before laying her head on the block, she bowed to the statue of Liberty which had been set up near the guillotine, and uttered the words that have become a classic—"O Liberty! what crimes are committed in thy name!" When her husband, who had escaped to Rouen, heard of her death, he committed suicide. See FRENCH REVOLUTION; GIRONDISTS.

ROLFE, *rolf*, JOHN (1585-1622), one of the first English settlers in America, celebrated in Virginia history as the first white man to raise tobacco, and, later, as the husband of Pocahontas, the famous Indian princess, daughter of Powhatan. In 1609 he sailed for the colony

of Virginia with Sir George Somers, but they were shipwrecked off the Bermudas. The following year, Rolfe landed in Virginia, and when Captain Argall, the unscrupulous deputy-governor, held Pocahontas as hostage for the purpose of extorting such terms from her father as he required, Rolfe married her in the presence of her uncle and two brothers. This event freed the colony from the enmity of Powhatan and preserved peace between the whites and Indians. A son was born of the marriage. After the death of Pocahontas (in England), in 1617, Rolfe returned to the colony and became a member of the first Virginia council. See POCAHONTAS; POWHATAN.

ROLLAND, ROMAIN. See FRENCH LITERATURE.

ROLLER, a bird of the tropics, related to the motmots (see MOTMOT). Its name is derived from its habit of tumbling in the air when in flight. The bird throws its food into the air and catches it in its mouth. It eats insects and plant seeds.

ROLLINS COLLEGE. See FLORIDA (Education).

ROLLO, OR HROLF. See NORMANS.

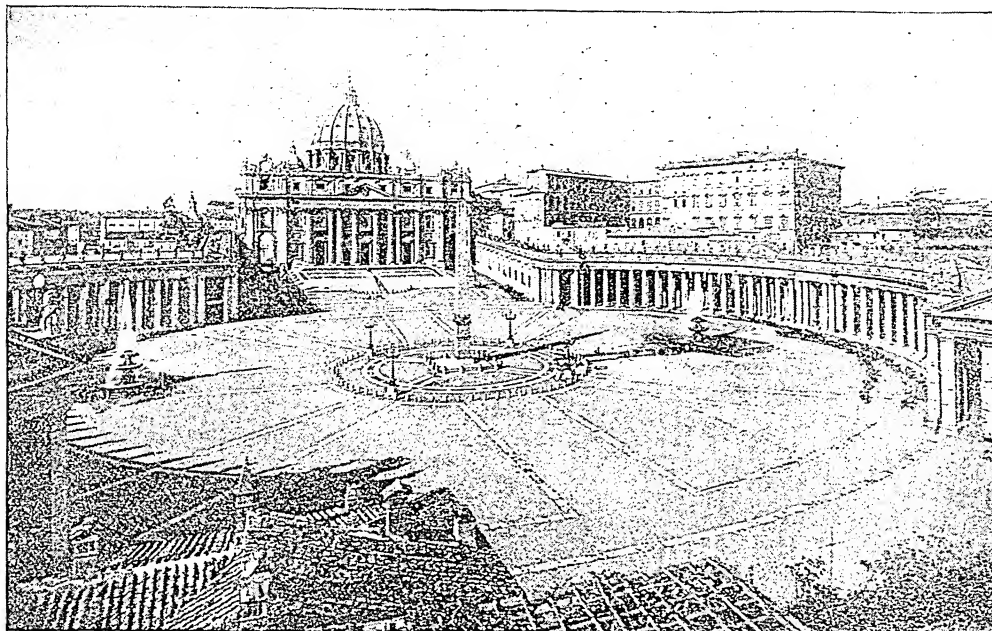
ROLLO BOOKS. See ABBOTT, JACOB.

ROLL SULPHUR, a name commercially applied to brimstone (which see).

ROMAN CATHOLIC CHURCH, that body of Christians which accepts the Pope as its head on earth and looks upon him as the representative of Christ and as the successor of Saint Peter in direct line. It believes that the special powers delegated by Christ to Peter have descended to the Pope, and that he is infallible, speaking *ex cathedra*, in all matters of religion. Any decree concerning faith or morals promulgated by the Pope, or by him and the bishops in council, is held to be of necessity free from error; for Roman Catholics believe that by special protection of the Holy Spirit, their Church has kept unchanged the doctrines laid down by Christ, and that it is impossible for errors to creep into the official teachings of the Roman Catholic Church.

The Hierarchy. This consists of the sovereign Pontiff, the Sacred College of Cardinals, several Congregations or ecclesiastical committees, patriarchs, archbishops, and bishops, apostolic delegates, vicars and prefects, abbots, and other prelates. The Supreme Council is the College of Cardinals, consisting of seventy members, six of whom are cardinal bishops, fifty cardinal priests, and fourteen cardinal deacons. There are about twenty lower Congregations, which carry on the central administration of the Church.

Doctrines and Sacraments. The doctrines or beliefs of the Roman Catholic Church are set forth in the Apostles' Creed and its variants, the Nicene Creed, the Athanasian Creed, and



SAINT PETER'S CHURCH, ROME

The most famous of Roman Catholic churches in all the world. The Vatican buildings, center of administration of the Roman Church, are at the right.

the Creed of Constantinople. The most minute statement of the doctrines, constituting a summary of the other creeds, is that issued by Pius IV in the sixteenth century, after the Council of Trent. Although the Church accepts the Bible (Douay Version) as the word of God and the Rule of Faith, it also accepts the body of truths delivered by Christ to the Apostles and their successors, which were not at first committed to writing.

The sacraments of the Church, which Roman Catholics insist are of the utmost importance, because of their belief that these were instituted directly by Christ, are seven in number. Three of them, the first, second, and sixth in the list below, are administered only once to an individual, because they are believed to make so definite an impression on the soul that repetition is unnecessary.

1. *Baptism.* This is administered to infants, as well as to adults. In the former case, it is held to wash away the original sin and to effect the sonship of the child with God by the infusion of sanctifying grace; in the case of adults, it moreover washes away all sins previously committed.

2. *Confirmation.* This sacrament confers the Holy Ghost and makes the Christian a soldier of Jesus Christ.

3. *Holy Eucharist.* This is a sacrament which truly and substantially contains body, blood, soul, and divinity of our Lord Jesus Christ, under the species of bread and wine. It is brought into existence by the consecration at Holy Mass, where bread and wine are substantially changed into the living body and blood of our Lord. It continues to exist as the adorable

"Blessed sacrament" as long as the appearances remain, and is thus preserved in the tabernacle of the altar. It becomes the nourishment of the faithful in Holy Communion. It was instituted by Jesus Christ at the "Last Supper" on the eve of His passion. A precept of the Church obliges every Catholic who has attained the use of reason to partake of this sacrament in Holy Communion at least once a year, at Paschal time. More frequent, even daily, Communion is counseled by the best theologians, as well as by the authorities of the Roman Church.

4. *Penance.* This consists of three stages: sorrow for sin and a determination to amend; confession, or accusation of one's self to a priest, who is vowed to eternal secrecy; and the acceptance of certain penitential acts which are imposed by the priest. The penitent being duly disposed, the priest may pronounce absolution.

5. *Extreme Unction.* As the other sacraments give help in the various affairs of life, so this imparts grace and strength to meet without flinching the bodily and spiritual struggle of the dying hour. It destroys the remains of sin and all the venial sins for which the soul is repentant at the hour of death.

6. *Holy Orders.* By this sacrament, the clergy are differentiated from the laity, and are admitted into the definite service of Christ, receiving at the same time the spiritual powers requisite for the exercise of their respective orders.

7. *Marriage.* According to the Roman Catholic Church, marriage is a sacrament instituted by Jesus Christ to sanctify the lawful union of man and woman, and to give them the graces necessary for their state. This bond cannot be dissolved except by reason of some nullifying circumstances which existed when the sacrament was attempted. Separation may be granted on account of circumstances occurring after the marriage, but not dissolution.

Further Beliefs and Ceremonies. The most sacred and solemn liturgical function of the Church is the Mass, which is the commemoration, continuation, and consummation of the Sacrifice of the Cross.

An outstanding feature of the Church is its belief in purgatory, a place of purification after death where satisfaction is made for the temporal punishment due to sin. These remains of sin and even venial sins, which do not separate the soul from God, are wiped out in purgatory.

All the saints of the Church are honored, but a special veneration is given to Mary, the Mother of Christ, who can, the Roman Catholic believes, obtain from Him many spiritual blessings by her intercession. Other saints, especially Joseph, the husband of Mary, may also intercede, but are not so powerful.

A Catholic has laid upon him six ecclesiastical precepts of especial force. He must:

1. Hear Mass on Sunday and holy days.
2. Receive Communion at the Easter time.
3. Observe certain fast days and days of abstinence.
4. Make confession to a priest at least once a year.
5. Contribute to the support of the Church according to his means.
6. Refrain from contracting marriage within the forbidden degrees of kindred, or privately, and from solemnizing marriage at certain times of the year.

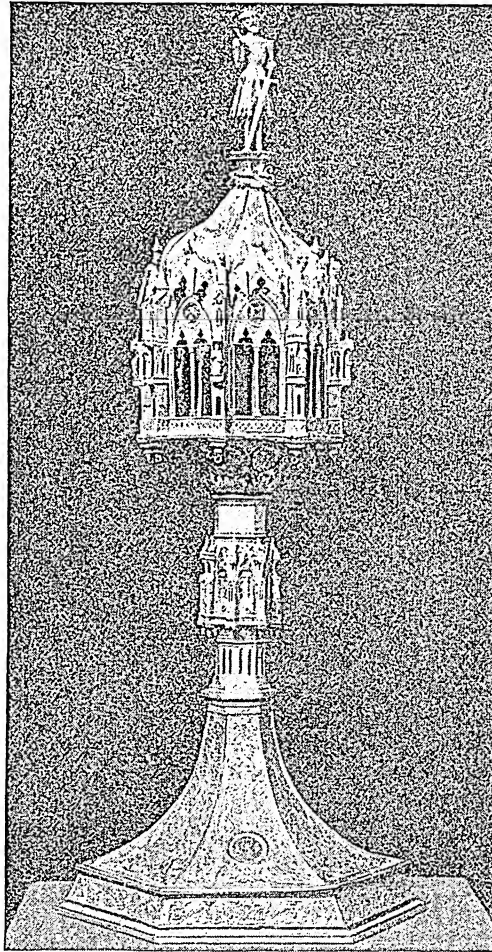
The Priesthood. The Church believes in a body of priests who stand as mediators between God and man, performing especially the function of offering sacrifice for the living and the dead. These mediators are set aside by the bishops, who are the direct successors of the Apostles. Of its priesthood the Church expects celibacy, holding that an unmarried clergy may serve God with more freedom and with undivided heart. The law requiring celibacy is for purposes of discipline only, and has nothing to do with the doctrines of the Church. Indeed, it is claimed there is nothing in the

doctrines which demands that the Church impose this obligation.

History. The Church of Rome is among the earliest of Christian organizations; after three centuries of persecution, it was given freedom by the edict of Constantine and Licinius and acquired increased influence. Bishops

were established in various parts of the empire, but the one at Rome remained supreme, and in time the title of *Pope*, or *father*, originally borne by all the bishops indiscriminately, began to be restricted to the bishop of Rome. In 1073 its use by any other bishop was formally forbidden by the Church.

During the Middle Ages, the Church wielded secular as well as religious domination, and at times held considerable territories, but the civil rulers never looked with favor upon this feature of the Church's activities, and long and fierce struggles were waged with the Holy Roman Emperors for supremacy. Sometimes one party, sometimes another, was in the ascendancy, and it was not until the Concordat of Worms (1122) that the spiritual and temporal powers of either claimant were strictly defined. With the establishment of the modern kingdom of Italy, in the nineteenth century, the Church was shorn of its secular powers, but in 1929 by



A RELIQUARY

It is in the Church of Saint Stephen, Bologna, Italy, and was made to contain the head of Saint Florian.

a concordat and treaty concluded by Pius XI and Mussolini, temporal power was restored.

The Roman Catholic Church has met opposition on more than one occasion. In the ninth century there began a schism within the body which resulted, two centuries later, in the withdrawal of the Greek Church from the Roman communion; and in the sixteenth century, the Protestant Reformation was the cause of another division. These movements, however, did not permanently affect the growth of the Church, particularly in countries of Southern Europe.

The Church in the New World. Twelve priests accompanied Columbus on his second voyage (1493), and in 1512 the first episcopal see was established at San Domingo. In 1522 the second see was established at Santiago de Cuba, and in 1530 the third was erected at Mexico City.

The Roman Catholic missionaries who pioneered in what are now the southeastern and southwestern parts of the United States were principally Spanish Dominicans, Franciscans, and Jesuits. They established themselves during the sixteenth, seventeenth, and eighteenth centuries. During the same period, French priests found their way to the Northeast, to Maryland and Pennsylvania, and along the Mississippi.

Statistics. The Roman Catholic Church has more members throughout the world than any other Church. Its total followers are estimated at 400,000,000, of whom about two thirds live in Europe. There are about 22,291,000 communicants in the United States. F.A.P.

Related Subjects. The numerous topics in these volumes which relate to the forms or the beliefs of the Roman Catholic Church or are important to its history are as follows:

Abbot	Inquisition
Altar	Jesuits
Archbishop	Litany
Ave Maria	Liturgy
Benedictines	Magnificat
Bishop	Mass
Breviary	Mendicant Orders
Bull	Mercy, Sisters of
Canon Law	Middle Ages
Canonization	Missal
Capuchins	Monasticism
Cardinal	Monk
Carthusians	Nun
Censer	Nuncio
Charity, Sisters of	Paulists
Conclave	Peter's Pence
Concordat	Pope
Counter-Reformation	Priest
Dominicans	Purgatory
Eucharist	Reformation, The
Franciscans	Rogation Days
Hermits	Rosary
Hierarchy	Sacrament
Holy Water	Sacred College
Incense	Uction
Index Expurgatorius	Ursulines
Indulgence	Vatican Council
Innocents, Feast of Holy	

The list under the article RELIGION contains certain general topics which will be of interest in this connection, and the biographies of the following churchmen, saints, and religious leaders may also be consulted:

Abelard, Pierre	Farley, John Murphy
Anthony, Saint	Fenelon, François
Aquinas, Saint Thomas	Francis of Assisi
Augustine, Saint	George, Saint
Becket, Thomas à	Gibbons, James
Bernard, Saint	Hayes, Patrick
Boniface, Saint	Ignatius, Saint
Bridget, Saint	Ireland, John
Cecilia, Saint	Jerome, Saint
Chrysostom, Saint John	Lanfranc
Daugherty, Denis J.	Loyola, Saint Ignatius of
Duns Scotus	Manning, Henry Edward
Dunstan, Saint	Mercier, Désiré

Mundelein, George W.
Newman, John Henry
Nicholas, Saint
O'Connell, William H.
Patrick, Saint
Peter the Hermit

Polycarp
Tetzels, Johann
Thomas à Kempis
Valentine, Saint
Xavier, Francisco de

ROMANCE, *ro mans'*, a name applied to any story, whether told in verse or in prose, which lays stress upon improbable and strange events, devoting less attention to presenting realistic pictures of life. Originally, the term meant any composition in one of the Romance languages (which see), but since tales of adventure, in the early periods of the modern era, were the most popular writings in those languages, the name gradually narrowed to its present significance. These languages were by no means the first in which such narratives were written, for the ancient Greeks delighted in stories of adventure which were clearly the forerunners of the modern romance. Of these the earliest is the *Odyssey*. The *Iliad*, which strove for truth in its pictures of scenes and characters, can hardly be so classed, but its companion epic, with its frankly mythical adventures, fills all the requirements. Later Greek romances introduced many of the themes which were common in the popular medieval and early modern stories, notably the wanderings of parted lovers and their final reunion.

During the medieval period, the romances which were so popular in Europe were in verse, adapted to recital by minstrels. Great national or local heroes were usually the central figures, and around their names were woven the most marvelous tales. About Charlemagne, Roland, Alexander, Arthur, Richard the Lion-Hearted, the heroes of the Trojan War, great cycles grew up, which were passed on from one bard to another, each amending or adding to the material received, as he saw fit. In the days of chivalry, love became one of the main motives for the action, though it was very often the artificial, platonic love of knight for noble lady, rather than a more human sentiment.

Gradually, even before the invention of printing, prose began to take the place of poetry in the making of romance. The cycle relating to Arthur was rearranged and put into English prose by Malory in his *Morte d'Arthur*. In the cases of the Spanish Cid and the French Roland, however, verse always remained the classic form of the narrative. By gradual growth the romance led to the novel, and some of the greatest novelists have been in the main writers of romances, rather than of the type more correctly called novels. Thus, Scott's works stand as the greatest of historical romances; most of Stevenson's tales are pure romances of adventure; and Hawthorne ranks among the greatest of romance writers. J.A.G.

Related Subjects. The reader is referred in these volumes to the biographies of the writers named above. See, also, ODYSSEY; CID; ROLAND.

ROMANCE LANGUAGES, those languages of the world which have a common origin in Latin, such as French, Italian, Spanish, and Portuguese.

Whenever Rome conquered a country, it sent colonists to "Romanize" the province, and these colonists, of course, took their language with them. This was not the literary Latin used in the classics studied in the schools to-day, but what is called *vulgar Latin*, meaning simply the everyday speech of ordinary people, such as soldiers, tradesmen, and farmers. Modified by the original language of the conquered country and changed by the usage of uneducated people and the variations of time, each country developed its own characteristic language. Thus, the Romance languages, though springing from the same Roman tongue, are distinct from one another.

In addition to those already mentioned, the Romance group includes Provençal, or Early French, which was the language of the troubadours who sang their ballads and romances during the Middle Ages; modern Rumanian; and Romansh. The last is a general name for the dialects in certain parts of Switzerland and the Tyrol, and in the region north of the Adriatic Sea.

The Romance languages depart from some present tongues by supplying verbal forms by use of auxiliaries, and by dropping inflections of nouns, making use of prepositions instead.

Related Subjects. The reader is referred in these volumes to the following articles:

French Language	Provençal Language
Italian Language	and Literature
Latin	Troubadour

ROMAN CIRCUS. See **CIRCUS**.

ROMAN EMPIRE. See map, article **AUGUSTUS**.

ROMAN GODS. See **MYTHOLOGY**, subtitle.

ROMANI, *rom' ah ne*, the name by which the gypsies call themselves. See **GYPSY**.

ROMANI, *ro mah'n' e*. See **QUIRITES**.

ROMAN NUMERALS, *nu' mur alz*, the number symbols of the Latin language, used to-day for numbering clock faces, for marking

1	5	10	50	100	500	1,000
·I·	·V·	·X·	·L·	·C·	·D·	·M·

ROMAN NUMERALS

books, particularly the pages of prefaces, the chapters, and the volumes of a series; for inscriptions on monuments and public buildings, and for numerous less important uses. But for all calculations in mathematics and in science, in business, and in everyday life, the Arabic system has been used since the twelfth century (see **ARABIC NUMERALS; NOTATION**).

The Roman system of counting, like most others, is by tens. This is because the counting

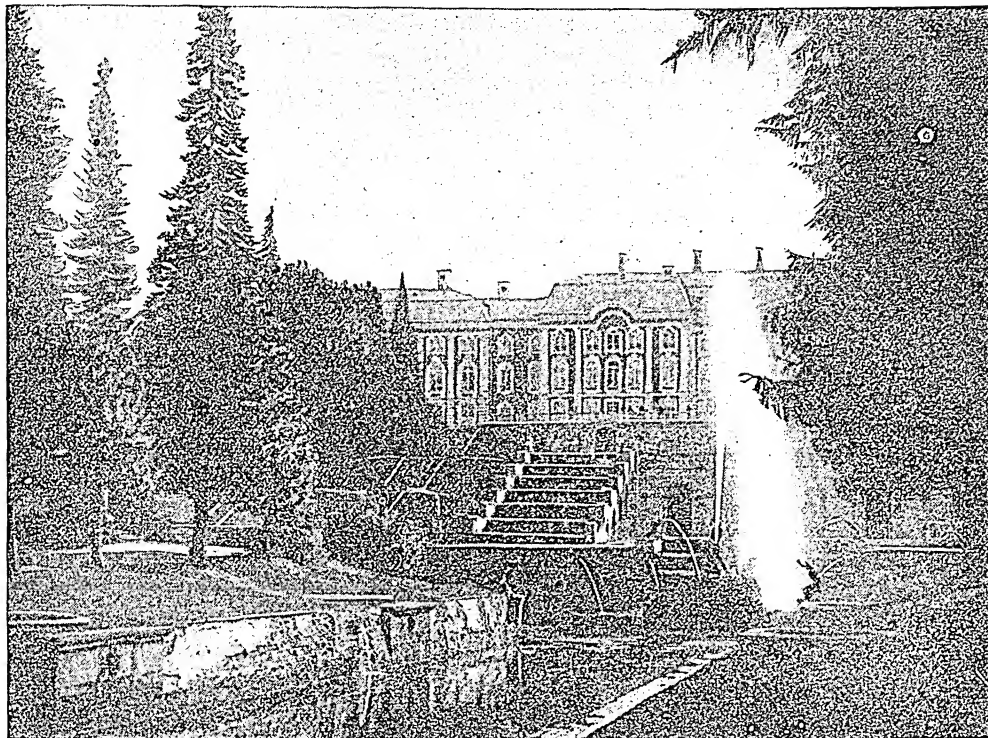
of most primitive peoples was done on the fingers. In the beginning it was not a letter system, although it is now written with the capital letters of the Latin alphabet. Most of the earlier symbols were derived from the Etruscans, a people that lived in the north of Italy many hundreds of years before the time of Christ. The symbol *I* was not the capital *I*, but was simply the most obvious mark for *one*, a vertical stroke. The symbols for two, three, and four, *II*, *III*, and *IIII*, are equally obvious. The origin of *X* (ten) was probably a crossed *I*. *C* (100) and *M* (1,000) stand for *centum* and *mille*, the Latin words for *one hundred* and *one thousand*, but in the beginning they, too, were expressed by Etruscan symbols which scarcely resembled the letters now used. These symbols may sometimes be found in the earliest printed books. The other signs are *V* (five), *L* (fifty), and *D* (500). There is no zero. All other numbers are made from combinations of the seven symbols given.

Numbers are written from left to right, and are made thus: an *M* is put down for every separate thousand; then five hundred is taken and *D* is written for it; next, as many hundreds are taken as possible, and a *C* is written for each; fifty is then taken and *L* is written for it; as many tens as possible are next taken, and *X* is written for each; five is then taken and *V* is written for it; and finally *I* is put down as many times as there are units left over. The number 2,500 is written *MMD* (one thousand plus one thousand plus five hundred); 3,550 is written *MMM DL*.

These numbers are not particularly long or tedious to write, but in order to express 3,768, which in the Arabic notation is just as brief as 3,550, this formidable row of letters must be put down: *MMMDCCLXVIII*. At a later date, subtraction by changing the position of the symbols came into use. Instead of writing *IIII*, the *I* is placed before *V*, and we have *IV*, which expresses one subtracted from five. Nine is written *IX* instead of *VIII*; forty is written *XL* (fifty minus ten). The year nineteen hundred used to be written *MDCCCC*, but it is now written simply *MCM*. J.W.V.

ROMANOV, *roh' mah nov*, was the name of the dynasty of mixed Russian-German origin that ruled Russia from 1613 to 1917. The Romanovs lost the throne as a result of the World War and the Russian revolution.

In 1613, at the end of the anarchic Time of Trouble, the nobles and Cossacks chose as their new czar the young Michael Feodorovich Romanov, distant kin to the preceding ruling family which had become extinct in 1598. Nineteen Romanovs in succession controlled the vast country; a twentieth was ruler but a few hours. In the eighteenth century, through marriage, the line became predominantly of German blood. Two able rulers are in the list,



IMPERIAL PALACE OF THE ROMANOVS

Photo: OROO

The magnificent Peterhof, on a rise of ground overlooking the Gulf of Finland, a few miles from the former capital, now Leningrad. The building was the principal home of the czars of Russia, but it is now used as a museum.

but most of the line were merciless autocrats. Because of their severity, the term *czar* has become a synonym for tyranny.

Peter the Great was the mightiest of the Romanovs; he found Russia floundering and almost wholly unorganized, and he left it a strong nation. Catharine II, profane, immoral, witty, but a capable leader, made her country respected in the courts of the world. For the most part, the other rulers kept the light out of Russia; they filled the country with subordinate officials who worked their masters' will; they hunted down all independent men with their remorseless secret service; they governed the land with hordes of wild, savage Cossacks; they brandished the knout instead of offering the ballot. They rode ahead, defying liberty and progress, and in themselves embodied the executive, legislative, and judicial functions of government. Not until the twentieth century was a limited legislative body tolerated by an unwilling monarch (Nicholas II).

Nicholas II, jealous of his power but weak, was the last representative of his line. When his abdication was forced, on March 15, 1917, he named his brother Michael his successor. The latter declared that unless it was Russia's will he would not ascend the throne. His

abdication followed.

The first Romanov was Michael, and he ruled thirty-two years; the last was Michael, czar for eighteen hours. A number of the grand dukes and duchesses of the Romanov line succeeded in escaping abroad. A few of them live in the United States.

A.P.

Related Subjects. For supplementary information, the following articles should be read:

Alexander	Nicholas
Catharine (II, Russia)	Peter I
Czar	Russia (History)
Duma	World War

· ROMAN ORDERS OF ARCHITECTURE.
See COLUMN.

ROMANS, *ro' manz*, EPISTLE TO THE, the most important of all the letters written by Paul the Apostle. In this he states fully his doctrinal beliefs. The epistle was written in the house of Gaius, at Corinth (A.D. 57-59), while he was on his third missionary journey. The theme of the whole letter, which forms a book in the New Testament, is found in this verse: "The gospel is the power of God unto salvation to every one that believeth" (*Romans* 1, 16). Thus he sets forth the doctrine of justification by faith, which Luther adopted as the basis of his system (see LUTHER, MARTIN; REFORMATION, THE).

ROMANSH LANGUAGES. See SWITZERLAND; ROMANCE LANGUAGES.

"ROMANS OF ASIA," a title bestowed on the ancient Assyrians. See ASSYRIA.

ROMANTICISM, *ro man' lih siz'm*, the name given in literature to the movement which marked a change from a rigid adherence to classic standards to an appreciation of imagination, sentiment, and the beauties of nature. No sharp line can be drawn between the Romantic period and the Classic which preceded it; no one country or poet can be given as the originator of the movement, but the change, though gradual, was very pronounced. No period in English history was ever more completely dominated by classic ideals than the so-called Augustan Age of Queen Anne. In poetry, particularly, form was placed before matter, and Pope was held by many to be the greatest of English poets because of the uniform correctness of his verse. Didactic and argumentative topics, which many present-day critics declare have no part at all in real poetry, were almost the only themes. Then came the reaction.

In 1727-1730, James Thomson published his *Seasons*, in which, for the first time, the note of interest in nature reappeared. Gray's *Elegy Written in a Country Churchyard*, Goldsmith's *Deserted Village*, and Cowper's *Task* repeated and strengthened the note, and Percy's *Reliques of Ancient English Poetry*, published in 1765, reawakened that interest in the past which was one of the characteristic features of the Romantic movement. Milton and Spenser, who had been looked upon as inferior to Pope, came into their own again, and their verse forms, instead of the mechanical couplet form of Pope, were imitated. The Romantic movement reached its height in Scott, Byron, Wordsworth, Shelley, and Keats,

while in prose, Stevenson was perhaps the greatest writer after Scott who emphasized the new note. See ENGLISH LITERATURE (The Romantic Age).

In other countries the Romantic spirit gained ground, just as it had done in England. The German authors Lessing, Herder, Goethe, and the group composed of the Schlegel brothers, Novalis, Tieck, and others, stood at the head of the movement in their country, while in France Rousseau, Chateaubriand, and Victor Hugo had most to do with the passing of the old classicism (see CLASSICS), although Lamartine and Flaubert must not be overlooked. J.A.G.

ROMAN WALLS, the lines of defensive walls erected by the Romans to protect the northern boundary of Britain from the inroads of the warlike Picts and Scots. Remains of these walls are still to be seen, and they bear striking witness to the permanent character of the work undertaken in ancient days. The first defensive walls were erected by Agricola, about A.D. 80. Of this wall, a few traces remain.

The fortifications running from the River Tyne to the Solway, completely across the northwest part of England, built by Hadrian in A.D. 120, and strengthened later by Severus, extended over eighty miles in length. Parts of the actual wall still remain. In places are still to be seen the stone drinking troughs, the guardhouses, and much of the stonework of the huge gateways, with the center stones worn away where the gates once met in closing.

The Wall of Antoninus, built in A.D. 139 between the rivers Forth and Clyde, marks the northern boundary of the Roman Empire. The Romans could press no farther against the valiant Picts and Scots, who waged incessant warfare and were never conquered. See ENGLAND (History).

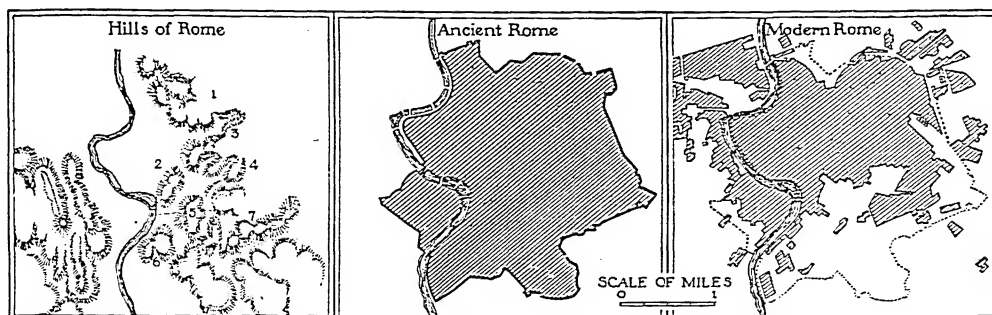
ROMAN WORMWEED. See RAGWEED.



R The STORY of ROME

ROME, ITALY. Since the dawn of recorded history, Rome has played a stirring part in the story of civilization. Modern Rome, the capital, with a population of 1,155,722 (1936)

is located in the province of Rome, district of Latium. The Tiber, celebrated in Roman literature for twenty-seven centuries, flows through the city on its way to the Tyrrhenian Sea about



THE ANCIENT AND THE MODERN CITY

At the left the location of the seven hills is shown; they are (1) Quirinal, (2) Capitoline, (3) Viminal, (4) Esquiline, (5) Palatine, (6) Aventine, (7) Caelian. The second and third maps compare the areas of the ancient city and present-day Rome.

seventeen miles distant on the western coast of Italy.

Although Rome is important as the cultural center of Italian life and the capital of Fascist Italy, it derives much of its fascination from the past. It has been well named "the Eternal City." Roman literature is read and loved today wherever there are educated men. Among the great Roman poets, Horace, Vergil, and Ovid are familiar to virtually every student.

Roman historians such as Tacitus, Livy, and Pliny have left accounts of the ancient world which are studied by our historians. In military science, the works of Caesar and other Roman tacticians are taught in many military academies in various countries.

Arising in the legendary period of the kings and culminating with the Code of Justinian, Roman law is the foundation for the legal systems of over half the nations of the world.

The Ancient Mistress of the World

The Mediterranean Sea was the center of the ancient world. Slowly civilization spread about its shores from east to west, from Egypt and Western Asia to Greece, and, finally, to Rome; and each nation, as it rose, developed, and eventually disappeared, contributed something to the growing civilization. Rome stood as an example of law and government—for the ability to organize an empire and to rule it; and it also preserved and handed down the treasures of science and of art which it had received from the older nations. The Roman Empire was the center of the world. All of the civilization of the ancient world helped to create it, and it was the focal point from which modern history originated; without a study of it, modern history is more difficult to understand.

The Period of Legend. The origins of Rome are lost in the dim mists of antiquity. What people founded it, from whence they came, or why, are questions which are answered only by legend. The Romans believed themselves to be descendants of the Trojan hero, Aeneas. Vergil's great epic poem, the *Aeneid*, describes in detail the tragic story of the Trojan warrior's life, from the sacking of mighty Troy to the establishment of a new kingdom which was to become Rome. See **ROMULUS** (Legendary Founding of Rome). Tradition says that in these early days Rome was a kingdom, and the names of the kings are given with many of the events of their reigns—Romulus,

Numa Pompilius, Tullus Hostilius, Ancus Marcius, Lucius Tarquinius Priscus, Servius Tullius, and Tarquinius Superbus. The last-named of these was so tyrannical that the people rose against him in 509 B.C. and expelled him, vowing that never again should one man hold life-long power. A republic was declared.

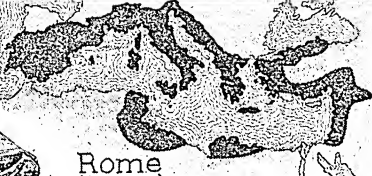
The Republic. While our knowledge of the Roman kingdom is based almost entirely on legend, something is known of the early history of the Republic. Most of the king's authority was delegated to two consuls, elected by the people for one year. The powers of each consul were equal and either could veto any command of the other, thereby checking any possible move toward despotism. To further assure the people against unrestrained use of the executive power, the Valerian Law was adopted, which forced the consuls to allow an appeal to the people themselves against a sentence which affected the life or position of a Roman citizen. This law did for the Roman substantially what the writ of habeas corpus does for the American. The Senate, or council of fathers, which had existed during the period of the kingdom, was retained. Its members were drawn almost exclusively from the ranks of the patricians, and it became the bulwark of the nobles' authority.

The *Comitia Centuriata*, originally an arbitrary division of the Roman citizens into military companies, became the Assembly,

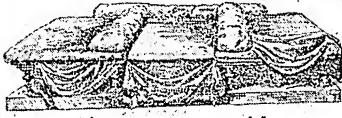
PRINCIPAL DATES	B.C.
Founding of Rome, about	753
Numa Pompilius	716
Tullus Hostilius	672
Ancus Martius	640
Lucius Tarquinius	616
Servius Tullius	578
Tarquinius Superbus	534
Republic Established	509

ROME

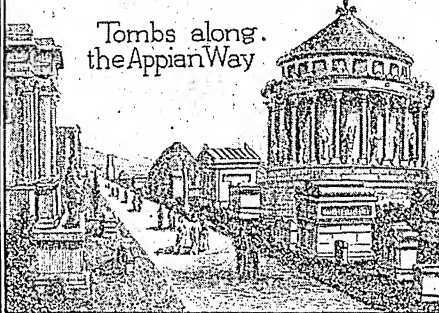
before the
CHRISTIAN ERA




Rome (in black)
64 B.C.




Roman dinner-table



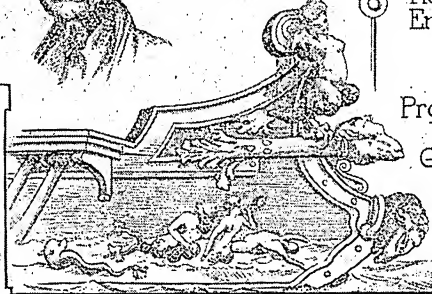
Tombs along the Appian Way



Caesar



Roman Emblem



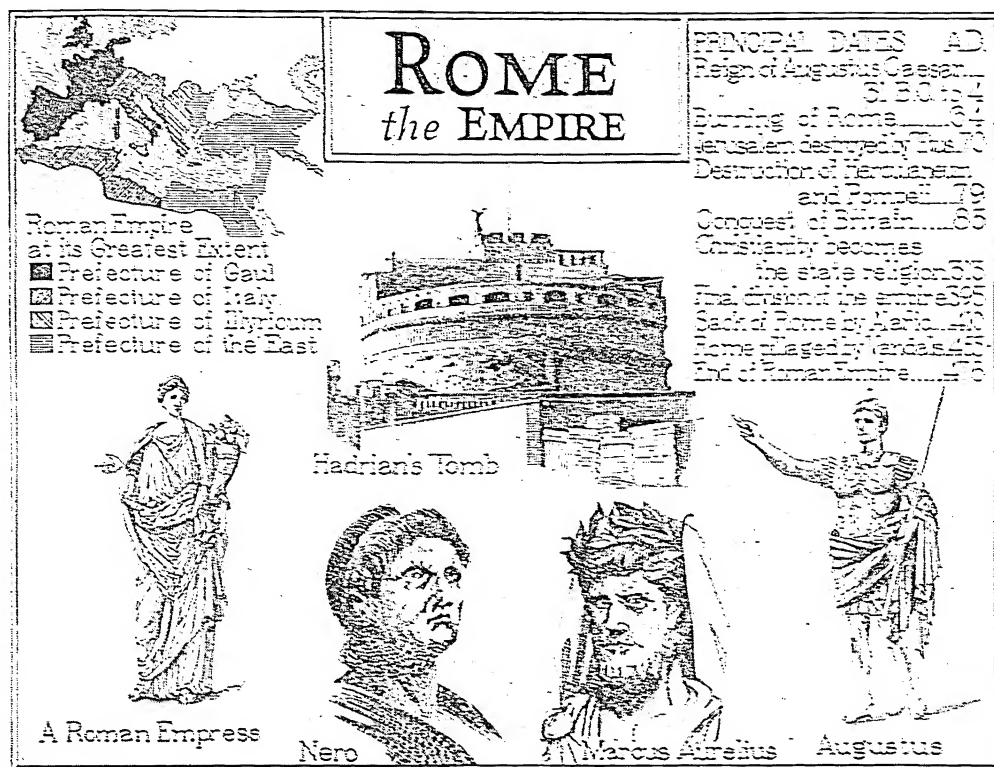
Prow of War Galley

with the right to choose the chief officials of the government and to make laws. The patricians, however, controlled the *Comitia Centuriata* because it voted in centuries or military companies, of which they had more.

The plebeians found that they actually had little voice in the government. In addition to political and social inequalities, their economic situation was serious. Rome had suffered heavily in the wars which followed the fall of the monarchy, and these losses were felt most immediately by the plebeians. To aggravate their unhappy economic position, the nobles, aided by the Senate, had diverted for their own use virtually all of the common lands belonging to the state. This meant that the plebeian farmer was denied use of the very land which he had helped to conquer. Further, harsh debtor laws existed which allowed a creditor to imprison his debtor if he was unable to pay his debt. In 494 B.C. the plebeians in full military array marched to the sacred Aventine, one of the seven hills of Rome, where they threatened to build a new city if the patricians refused to grant their demands. The Senate, realizing that the plebeians were necessary if the Republic was to continue, made a number of concessions. One of the most important of these was the creation of *tribunes of the people*, who had as their special

office the protection of the rights of the plebeians. Originally, the number of tribunes was probably two, but was increased later to five, and finally to ten. The most important of their powers were the privilege of defending a plebeian on any charge, and a veto on measures proposed by the Senate. The plebeians also secured for their assembly, always unrecognized, legal standing and certain definite powers.

Written Laws. The establishment of tribunes was a victory for the plebeians, but they soon discovered that it was impossible to secure a just administration of law as long as it remained unwritten. The plebeians demanded that the law be written, so that everyone might know what it was. In 451 B.C. a commission of ten men, the *decemvirs*, were granted full powers to govern the Republic for one year while they codified the law. At the end of the year only ten out of twelve projected tables were completed. The decemvirate was, therefore, extended. During its second term it became so despotic that the plebeians again seceded to the Aventine, which resulted in still further extensions of liberty. The Twelve Tables of the decemvirs became the foundation of all subsequent Roman law. Centuries later under the Emperor Justinian a final code was made, the foundation for the law of most of the nations of the world today.



Other Plebeian Gains. Not content with their growing political power, the plebeians demanded social equality, and in 445 B.C., compelled the Senate to agree to a law permitting marriage between the two classes. There was still one sharp grievance, however—the sacred office of consul remained open only to patricians. The Senate agreed to the election of military tribunes with consular powers, who might belong to either order, but even this concession was not satisfactory, and the struggle continued. In 367 B.C., the Senate was forced to agree to the Licinian Law, which declared that one consul each year must be a plebeian; and the great victory had been won.

External Expansion. Outwardly, this period had not been one of peace. The Etruscan towns, subdued during the time of the kings, revolted after the kings had been driven out, and Rome had to fight for its very life. Volscians, Etruscans, and Aequians led their armies against the city, but in the end, Rome conquered, and became again the head of the league of Latin cities. But in 390 B.C., there came a stronger enemy, the Gauls from the north. They sacked the city, destroying everything valuable in their seven months' stay, but failing to take the citadel, which was heroically defended by Manlius. After 367 B.C., when the class struggle finally closed, expansion was

rapid. It was not, however, unresisted. The Latins revolted for the last time in 338 B.C., but were crushed and made subject to Rome; and in 343 began a struggle with the Samnites, rude and aggressive mountain tribes, which did not terminate for fifty-three years, but which left Rome dominant in the peninsula. One more struggle, with Pyrrhus, king of Epirus, and all the peoples of Italy acknowledged the supremacy of the city on the Tiber.

"Carthage Must be Destroyed." But outside of Italy was an enemy not so easily subdued—Carthage, on the North African coast, the greatest sea power in the world. Though originally the two cities had been allies, an inevitable jealousy had grown up between them, which, in 264 B.C., resulted in open war. Three terrific wars, known as the Punic Wars, were fought before Rome gained that final victory which had been made possible only by the creation of a navy and the breaking of Carthaginian power on the sea. True, the close of the First Punic War, in 241 B.C., saw Carthage exhausted and ready to make almost any terms, but Rome realized, as the statesman Cato declared in every speech, that "Carthage must be destroyed," and consequently prepared for further war. In the Second Punic War (218-202 B.C.), the outstanding figure was Hannibal, the Carthaginian general, whose crossing of the

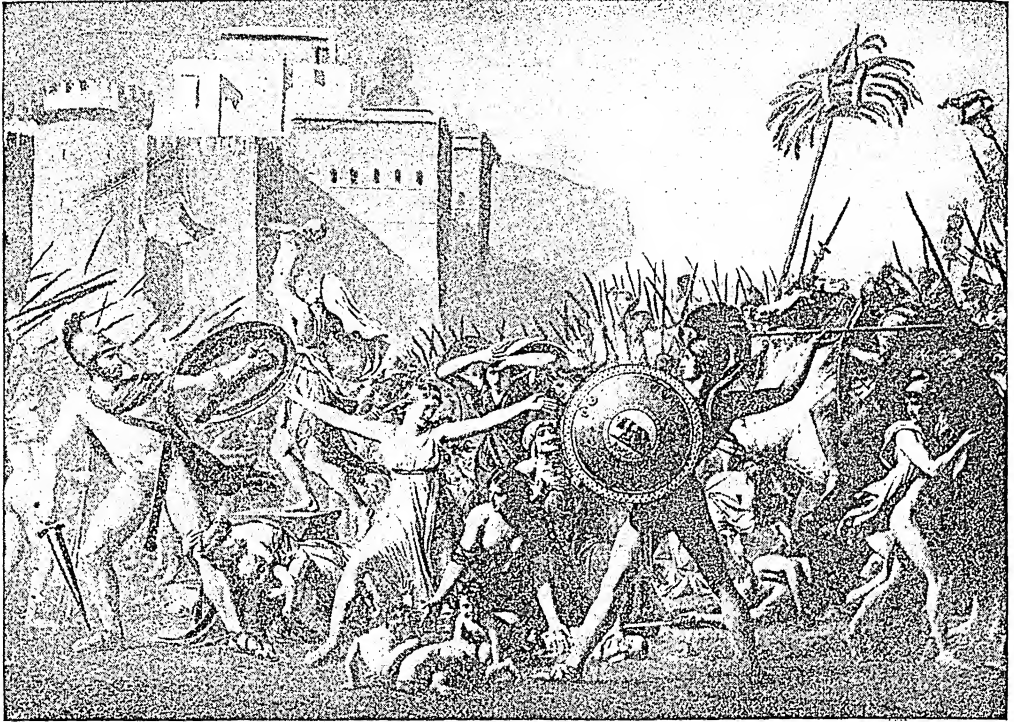


Photo: Visual Education Service

THE RAPE OF THE SABINES

[The original painting hangs in the Louvre, in Paris.]

Alps was one of the dramatic events of history. The disasters which the Romans suffered at his hands were avenged when Scipio won his decisive victory at Zama, and Carthage gave up to Rome all of its colonial possessions, its navy, and its elephants, and promised never again to make war without the consent of Rome.

Philip V of Macedon, in the old Greek state, had aided Hannibal, and to punish him Rome sent armies to the East. In three wars, the last one ending in the complete defeat of the Greeks at Corinth, in 146 B.C., the Macedonian empire was broken up and Greece was made a Roman province. In the same year also ended the Third Punic War, which consisted merely of the three-year siege of Carthage. The defense was heroic but vain, for the splendid city was destroyed and the Carthaginian empire was ended. Meanwhile Spain, received from Carthage, had proved very unsubmitive, and only by the constant presence of a large army could it be kept in subjection.

Last Century of the Republic. During this period, the two streams continued to flow side by side—of class dissension within, of conquest without. A change had begun to show itself in the national character—a departure from the simplicity and severity of the early life, and an ever-increasing luxuriousness and immorality.

Occasional reformers arose, but never was the tide successfully stemmed, and through all the years when Rome was most glorious in the eyes of the world, its people were slowly disintegrating, slowly preparing for that decline which later came with such apparent rapidity. Sincere and steadfast belief in the old gods was dying out, and to take its place there was only skepticism among the upper classes and superstition among the lower.

Internal Affairs. Nominally, both orders of Roman citizens had the same civil and political rights; in reality, however, power was in the hands of the wealthy nobles, who governed entirely in their own interests. Champions of the plebeians were not wanting, who fought desperately to better their condition, but little of permanence was accomplished. The land system continued as unjust, the officials as untrustworthy. Nor were the plebeians within the city the only ones who struggled for their rights. The subject Italian peoples, demanding the rights of citizenship which had been limited to the inhabitants of Rome, precipitated in 91 B.C. the so-called Social War, in which the military genius of Marius, Sulla, and Pompey made Rome victorious. But, wisely enough, the subject peoples were given what they demanded, and henceforth had the franchise. Three years later, the jealousy of Marius and



Photo: Visual Education Service

RUINS OF THE PALACE OF THE CAESARS, ON PALATINE HILL

Sulla led to that bloodthirsty conflict known as the Civil War, in which the two parties, the lower class under Marius and the patricians under Sulla, proved equally violent. No man was safe from massacre, and not until 82 B.C. was the struggle ended by the triumph of Sulla. In 63 B.C., another danger threatened the city—the conspiracy of Catiline—which was foiled only by the watchfulness and genius of Cicero.

External Conquests. During this time, more than one war was brought to a successful conclusion. Jugurtha, who had seemed invincible, was conquered by Marius, and the terrible menacing hordes of the Cimbri and Teutons were turned back by the same hero, at a time when it had seemed that Rome was surely doomed. Another famous conflict of these years was the war with Mithridates of Pontus. It was the appointment of Sulla to the command in this war which had so inflamed the jealousy of Marius, but it was Pompey who brought the struggle to a successful conclusion. But the most important of all in their after effects were the campaigns of Caesar in Gaul, which made him so popular and so powerful that Rome lay at his feet.

The name of Pompey suggests a list of names of men who for a period held the fate of Rome in their hands; for the Senate, so long almost

absolute, had lost by degrees its power, and the day of the individual had come in Roman history—of the individual who was strong enough and unscrupulous enough to seize the power and wield it for his own good. Pompey, Caesar, Crassus, Cicero, Lepidus, Mark Antony, Augustus—the lives of these men made up the history of Rome in this concluding period of the republic. Civil war followed the death of Caesar, and from it one man, Octavius, emerged supreme.

The Growing Empire. Having rid himself of all rivals, and accepted from the hands of a compliant Senate all the highest offices, Octavius, or Augustus, as he was henceforward called, established what was in effect an empire, though the name and some of the forms of the republic were still preserved. During his time, the glory of Rome was at its height, and though none of his successors equaled him in ability, the power was so firmly grounded that it endured and even apparently increased for almost two centuries. To be a Roman citizen was one of the greatest honors the world afforded, for back of every citizen stood the vast power of the empire. In the twenty-second chapter of the book of *Acts*, there is a description of the persecution of Paul in Jerusalem which may be paraphrased as follows:

And when they had tied him up with the thongs, Paul said unto the centurion that stood by, "Is it lawful for you to scourge a man that is a Roman, and uncondemned?"

And when the centurion heard it, he went to the chief captain and told him, saying, "What art thou about to do? For this man is a Roman." And the chief captain came and said unto him, "Tell me, art thou a Roman?" And he said "Yea." And the chief captain answered, "With a great sum obtained I this citizenship." And Paul said, "But I am a Roman born."

They then that were about to examine him straightway departed from him; and the chief captain also was afraid when he knew that he was a Roman, and because he had bound him.

Occasionally, during the first two centuries, a tyrant arose, as Tiberius or Nero, who set aside the forms of constitutional government and was frankly despotic. In the main, it was only the city of Rome which suffered at the hands of such men, the provinces being efficiently governed; but in the later years, even the forms of constitutionality were ignored.

Tiberius, the successor of Augustus, was able but unscrupulous, and it was he who instituted that system of spying which so many of the later emperors employed. During his reign occurred the Crucifixion of Jesus of Nazareth. His successors were the mad Caligula (37-41), with his insane follies; Claudius (41-54), during whose reign Southern Britain was subdued; and Nero (54-68), whose name is a synonym for cruelty and viciousness. During Nero's reign, the burning of Rome took place, and the persecution of the Christians, who were accused of having set fire to the city.

A listing of the emperors is not necessary. Many of them were mediocre men, who obtained their power by bribing the army; but now and then one stands out by reason of especial ability or goodness. Thus there were Vespasian and Titus, father and son, whose reigns were noteworthy for their freedom from tyranny; and there were the "five good emperors," Nerva, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius, whose reigns extended from 96 to 180. It was during the reign of Trajan that the Roman Empire reached its very greatest extent, for Hadrian, realizing that far-distant frontiers were but a danger to the empire, abandoned the territories beyond the Euphrates in Asia.

The Decline of the Empire. This began with Commodus (180-192), the infamous son of the illustrious Marcus Aurelius, and proceeded slowly at first, but later with frightful rapidity. The army became the dominant force, and for almost a hundred years (193-284) placed upon the throne one after another of the "barrack emperors," so called because they were placed in power by the army. The first of them, Septimius Severus (193-211), was the ablest, and if he governed with a firm hand, like a

soldier, he at least kept the empire intact. A second persecution of the rapidly spreading sect of Christians took place under him, but later he took the new religion under his protection. A temporary respite came with the reign of Alexander Severus (222-235), who was a just man, but after his time, came chaos and almost anarchy. Within the city there were warring claimants to the throne; on the borders, savage hordes were pressing farther and farther in. From 268 to 284 there was a succession of emperors who showed some ability, and for a time the tide was stemmed, but their reigns were short and they accomplished nothing permanent.

Diocletian (284-305), under whom occurred the last frightful persecution of the Christians, perceived that one man could not administer so great an empire, and divided the state into East and West empires, making Maximian joint emperor; and from that time on, there are two parallel streams of Roman history. The dissolution had begun; but under the great Constantine, who was sole ruler from 323 to 337, the state was again united. He made Christianity the State religion, and moved the center of government from Rome to a newly founded city on the Bosphorus, which he called Constantinople. After Constantine's death came another period of wild disorder, during which the only living, growing thing in the empire seemed to be the Church. Julian (361-363), called the *Apostate*, tried to restore paganism, but the Church had become too strong to be overthrown.

The Fall. Occasionally, an emperor or a general arose who was strong enough to beat back the barbarians—Huns, Goths, Franks, Alemanni, or Visigoths—who were threatening the frontiers, but it became clear that the end of Rome's power was approaching. Theodosius the Great (379-395) might in a more favorable time have proved one of the strongest of the emperors, but even his efforts were in vain. In 410, when the genius of the famous general Stilicho was no longer opposed to them, the Goths, under the ruthless Alaric, ravaged the peninsula of Italy, and for three days pillaged Rome. The legions had to be withdrawn from the provinces to protect the city, and everywhere the barbarians pressed in. The Visigoths took Spain and Southern France, the Vandals possessed themselves of Northern Africa, and the Huns laid waste the Eastern districts. In 451 the Huns, under Attila, were turned back from Rome only by the pleas of Leo the Great, bishop of Rome. Four years later, the Vandals sacked the city, and then for a period the Suevic Ricimer was supreme in the city, though there was still a nominal emperor.

The powerless ruler in 476 was a boy who bore, strangely enough, the name of Romulus, founder of the city. Perceiving his weakness,

Odoacer placed himself at the head of all the hired troops in the city, dethroned Romulus, and took the title of king of Italy. Thus the Roman Empire was brought to an end, though, in the time of Charlemagne, the name came into vogue again in connection with that strange creation, the Holy Roman Empire (which see). For the Eastern Roman Empire, see BYZANTINE EMPIRE.

How the City Looked. The city which was the center of this vast empire naturally bore in its long history many aspects, but the best-known one is that which it presented in the days of Augustus. He "found a city of brick and left one of marble," it was said, but most of the streets were narrow and crooked, and some of them were very dirty and squalid. Some parts, however, with their white marble buildings, their porticoes, and triumphal arches, were marvelously beautiful. Just what the limits of the city were in those days cannot be known, but

it was doubtless somewhat larger than the later walled city; for it was not until the days of Aurelian (270-275) that a line of fortifications was built about the city. Nor is it possible to determine just the population of the city. Some authorities declare that in the days of the early empire it was 2,000,000, but this is regarded by most scholars as an extravagant estimate.

The centers of the city's life were the *fora* (plural of *forum*), or open places for public meetings, and one of these was so much more important than the others that it was called the Roman Forum. Far more splendid, however, was the forum of Trajan, about which were grouped some of the most beautiful buildings of the city. Here stands to this day the great Column of Trajan with its sculptures which have revealed to modern scholars much about the customs and methods of fighting, as well as about the history of Trajan's day.

The Romans were famous for their engineering works, and most of all, perhaps, for their roads. Within the city the chief street was the *Via Sacra*, or *Sacred Way*, which ran from the Forum to the summit of the Capitoline Hill, where stood the oldest and most sacred temple

in the city—that of Jupiter Capitolinus. Along this road, whose lava-block pavement is still in fairly good condition, passed the famous triumphal processions of the emperors and generals, as they returned from victorious wars. Without were world-famous roads, the Appian Way (page 323) and the Flaminian Way. Then there were wonderful sewers, of which the most famous, the *Cloaca Maxima*, is still in use, though it was built in the time of the kings; and the aqueducts through which water was brought to the city from the far-away Apennines.

Some of these still carry the city's water supply. See AQUE-DUCT.

Buildings. To list all of the important buildings in an article of this length is impossible; some few, however, must be noticed. There were temples everywhere—no fewer than three hundred of them, it is said; and the sites of many of these are known. Most famous of all was the Pantheon, a temple to all the

gods, as the name indicates. This great circular-domed building is to-day the most perfectly preserved of all the ancient Roman structures. Some of the old temples have been turned, in part at least, into churches, and so have been preserved.

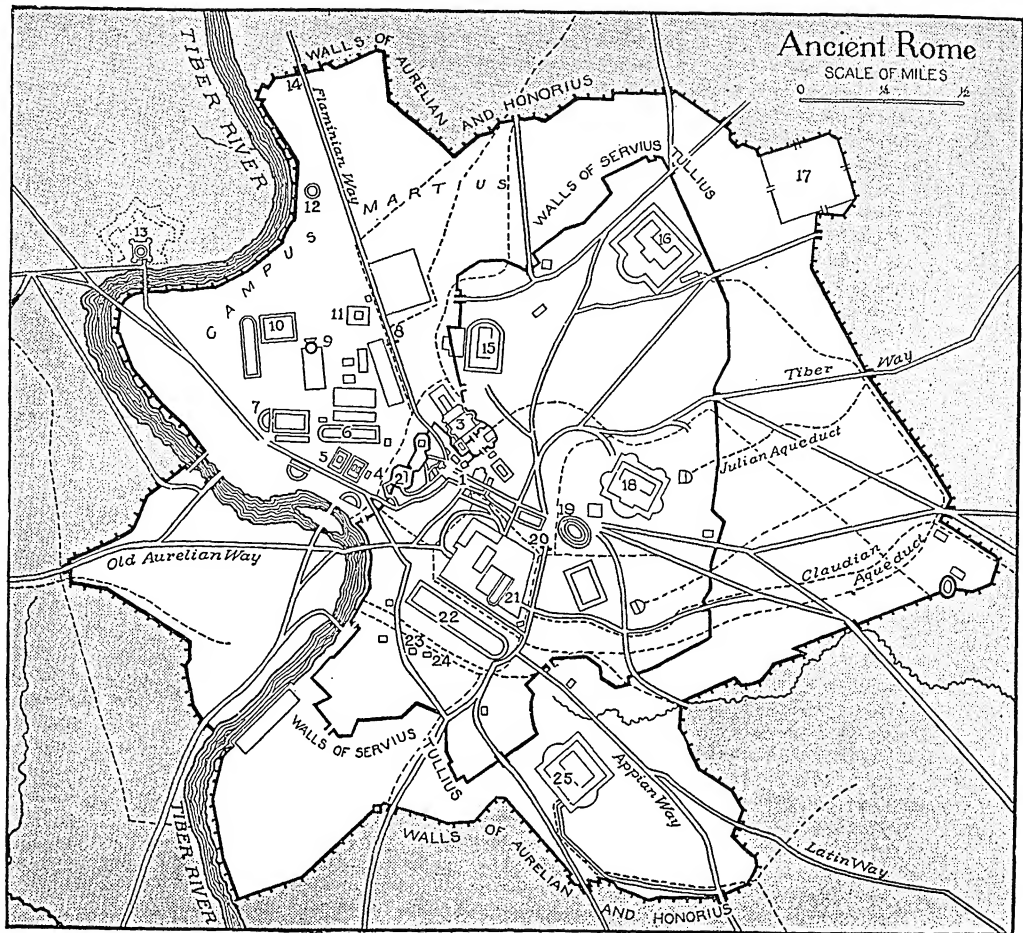
There were numerous public baths, which formed one of the most characteristic features of the imperial city, and the ruins of some of these great buildings, with their sumptuous decorations, prove the love for luxury which was an inherent part of Roman character in imperial days. Of amphitheatres, in which the city abounded, the oldest was the *Circus Maximus*, built in the days of the kings, but the most famous was that known as the *Colosseum*, which constitutes the most imposing ruin of Rome. Many of these theaters were built on the *Campus Martius*, the great plain within the curve of the Tiber, which was given up largely to sport and to military exercises. Another characteristic feature of the city was the triumphal arches, those soaring structures which the emperors built to commemorate their victories.

One of the illustrations accompanying this article gives an idea of the city and of its best-



THE CLOACA MAXIMA

A present-day view.



IMPORTANT FEATURES OF THE ANCIENT CITY

- | | | | |
|----------------------|-----------------------|--------------------------------------|-------------------------|
| 1. Forum | 8. Arch of Diocletian | 15. Baths of Constantine | 20. Arch of Constantine |
| 2. Capitol | 9. Pantheon | 16. Baths of Diocletian | 21. Hippodrome |
| 3. Forum of Trajan | 10. Baths of Nero | 17. Camp of Praetorian Guard | 22. Circus Maximus |
| 4. Temple of Apollo | 11. Temple of Neptune | 18. Baths of Trajan | 23. Temple of Minerva |
| 5. Temple of Jupiter | 12. Tomb of Augustus | 19. Flavian Amphitheater (Colosseum) | 24. Temple of Diana |
| 6. Circus Flaminius | 13. Tomb of Hadrian | | 25. Baths of Caracalla |
| 7. Theater of Pompey | 14. Flaminian Gate | | |

known landmarks in the days of its great prosperity.

Woman under Roman Domination. During the earlier days of Rome, a woman was under the authority of her father or her nearest male relative, prior to marriage. Passing to her husband, she legally was looked upon as the *daughter* of her husband. She possessed no legal rights of importance. That some women in time acquired great wealth is evidenced by laws passed to limit their holdings and to circumscribe the costliness of their attire. In 159 B.C., a law was passed forbidding a woman to inherit more than a certain sum, but methods of evading such laws were soon found. Evasions of this nature constituted one of the factors that contributed to women's inde-

pendence under the Roman law. Even during the most splendid period of Roman history, women remained under the tutelage of their families or of guardians appointed by parents. After they were practically free from their husbands' control, the repeal of the laws investing the family with domination over female children gave women an independence scarcely equaled in the present age of "women's rights." From this time on, women gained more and more power in the Roman state.

The Roman matron was supreme within her own household, and because of her wisdom and her many virtues, through the men of her household she influenced affairs of state. Like the modern feminist, she canvassed the streets of Rome for votes, making public

speeches and attempting to influence the opinions of the politicians. Indeed, so great had become women's influence that Cato thundered, "If men had retained their rights and dignity within the family, the women never would have broken out publicly." Women were allowed greater freedom in dress, and

the right to wear jewels and to ride in chariots. The influence of such Roman matrons as the Cornelias, Octavia, Calpurnia, wife of the younger Pliny, and the two Agrippinas, well illustrates the power enjoyed by the "weaker sex" in Roman life—an independence hardly excelled by that of the women of the present day.

The Modern City of Rome

Intervening History. For centuries after the fall of the empire, Rome was but a dependency of the Byzantine Empire, and had no history but that of the Church. Latterly, its life has been merged in that of Italy, for with the stirrings of the desire for Italian unity came a renewed feeling for Rome as a secular as well as a Church capital. In 1848 Pope Pius IX was driven from the city and a republic was formed, but in the next year, French troops recaptured the city, and under their protection, the Pope reigned until 1870, when Italian troops possessed it. In the following year, the famous city, with all its heritage of glory and of disaster, became the capital of United Italy. The king took up his residence in the Quirinal, and the Pope became, according to his own description, a "prisoner in the Vatican." In 1929, by an agreement between Mussolini and the Vatican, an independent Papal State was established, and Pope Pius XI abandoned the policy of never leaving the Vatican.

The history of Rome since unification is bound up with that of Italy as a whole [see ITALY (History)]. The famous "march on Rome" of the Black Shirts, in 1922, made the city the center of the Fascist revolution, which transformed Italy completely. Its population of 1,330,600 (1940) ranks it as the first city in Italy.

General Description. It is impossible to consider the "Eternal City" simply as the capital of a modern nation apart from its historic associations, for there are evidences of the latter on every hand.

Rome to-day is about fifteen miles in circumference. About it stretches a wall which is in large part that built by the Emperor Aurelian, and within this the Tiber divides the city into two unequal parts. On the right bank are those great centers of Catholic Christendom, the Vatican and Saint Peter's, and a populous section has sprung up around them; but the larger part of the city is on the other side of the Tiber, on the old Campus Martius. Ten fine bridges, three of them ancient in part, cross the river within the city walls, and the treacherous stream has been confined within stone embankments, that it may not overflow, as in former times. Since the introduction of modern improvements, Rome has been a healthful city, despite its situation on the fever-breathing *Campagna*, the plain surround-

ing Rome, made malarial by the overflow of the Tiber and the resulting marshes. This area has been improved by a modern system of drainage.

The Seven Hills. The Palatine Hill, where was planted the very earliest settlement, is now in part a public park, in part a mass of ruins, among which excavations are still being made. Here stood in olden times most of the palaces of the wealthy Romans, and modern research is revealing remains of great splendor. On the Aventine and Caelian hills, too, are ruins, and little else, for few modern habitations have been built there, while on the Esquiline and Viminal have sprung up crowded industrial quarters. The Quirinal, near the center of the modern city, is crowned by the royal palace and the chief public buildings, while the Capitoline Hill, as in ancient days, is a most impressive spot. Here stands the Capitol, designed by Michelangelo to take the place of the ancient structure, and here are famous modern museums of art and an equestrian statue of Marcus Aurelius, the only perfect antique statue of its kind in existence.

Other hills there are which were not numbered with the original seven—the Pincio, which, with its beautiful gardens and walks, constitutes a favorite afternoon resort, and the Janiculum, on the other side of the Tiber. This was the old lookout spot, the outpost of the city.

For since Janiculum is lost,
What hope to save the town?

says Macaulay. To-day it is laid out in public drives and walks. Archaeological excavations are being carried on, and many interesting finds have been made.

The New Rome. Among the ambitious plans of the Fascist dictator, Mussolini, was the modernization of the city, but "without damage to its heritage." A five-year city-planning program was inaugurated in 1926, under the direction of a chief architect. This program authorized the making of new thoroughfares to give access to the outside districts and relieve traffic congestion; the harmonious arrangement of dignified buildings and spacious squares, opening up new vistas and making more impressive the old ruins and monuments; and the uncovering of many other buried structures. The new Rome is a city of modern

transportation and of fine recreation facilities. An impressive structure completed before this program was well under way is the colossal monument to Victor Emmanuel II, dominating the Piazza Venezia, one of the central squares. The monument is a huge platform with broad flights of steps, and is constructed of Carrara marble and profusely ornamented. An equestrian statue of the king rises from the summit.

Churches and Institutions. Rome has its full share of churches, among which may be mentioned the great Saint Peter's and the Lateran; and of palaces, of which the Barberini, Colonna, Farnese, Orsini, and the Borghese (outside the city) are the most famous. This latter contains a celebrated collection of pictures. Rome is rich in museums, whether of paintings, of sculpture, or of antiquities. The greatest is the Vatican, but the Capitoline Museum also contains some of the world's chief art treasures.

Among the schools of Rome, the university is the oldest and most famous, but it has no longer the importance which it possessed four centuries ago. There are many seminaries for the training of priests and of diplomats, various academies of arts and sciences, and schools for classic study founded by almost all the leading nations. Best known of these to Americans is the American Academy on the Janiculum Hill.

Government. Since 1925 Rome has been under the control of a governor appointed by the king. He is assisted by two vice-governors, ten lower officials, and an advisory council of eighty, selected from lists compiled by various trade, professional, and educational bodies.

The Spirit of Rome. To every lover of classical culture, Rome has assumed an especial importance. It is a living, inspiring symbol of the glory that enabled this city to be the mistress of the ancient world. It has also been since medieval days the great pilgrimage center of Christendom. During the first three and a half years of World War II, the Allies were true to their promise to the Pope to hold the religious monuments of Rome sacred and to spare such great landmarks as the Colosseum and Forum. When the city was finally bombed in July, 1943, the chief objectives were military installations. M.B.O., Jr.

Related Subjects. The reader is referred to:

HISTORICAL ARTICLES

Agrarian Laws	Fasces
Appian Way	Fascism and the
Atrium	Fascisti
Augustus	Forum
Byzantine Empire	Gladiators
Caesar	Goths
Campus Martius	Helvetii
Censors	Huns
Cimbri	Legion
Circus	Lictors
Colosseum	Lupercalia
Comitia	Pantheon
Consul (The Roman	Papal States
Consul)	Patrician
Decemvirs	Plebeians

Pontifex
Praetor
Praetorian Guard
Punic Wars
Quaestor
Quirinal
Quirinus
Quirites
Sabines

Samnites
Saturnalia
Tarpeian Rock
Toga
Tribune
Triumph
Triumvirate
Twelve Tables, Law of
Vatican City

BIOGRAPHIES

Agricola, Gnaeus Julius	Lepidus, Marcus A.
Antony, Mark	Lucretia
Augustus	Marius, Gaius
Aurelian, Lucius D.	Mithridates
Aurelius, Marcus	Mussolini, Benito
Brutus, Marcus Junius	Nero
Caesar, Gaius Julius	Nerva
Caligula	Numa Pompilius
Catiline	Odoacer
Cato	Otho, Marcus Salvius
Cicero, Marcus Tullius	Pompey
Cincinnatus, Lucius Q.	Pyrrhus
Claudius	Regulus, Marcus Atilius
Cleopatra	Scipio
Constantine	Seneca, Lucius Annaeus
Coriolanus	Servius Tullius
Crassus, Marcus L.	Severus, Lucius S.
Diocletian	Sulla, Lucius Cornelius
Domitian	Tarquinius, Lucius
Fabius	Theodoric
Galba, Servius Sulpicius	Theodosius I
Gracchus	Tiberius
Hadrian	Titus
Hamilcar Barca	Trajan
Hannibal	Valens
Jugurtha	Valentinian I and III
Julian	Valerian
Justinian I	Vespasian

ROME, GA. See GEORGIA (back of map).

ROME, N. Y. See NEW YORK (map).

ROMEO AND JULIET. See SHAKESPEARE, WILLIAM (Synopsis of the Plays).

ROMNEY, GEORGE (1734-1802), an English painter who became renowned for his portrait work. He had but little technical training in his art, and was in large measure self-taught. The first picture that he exhibited was *The Death of Wolfe*. His portraits included *The Parson's Daughter*, about thirty studies of Lady Hamilton, the children of the Earl of Gower, Lady Cavendish Bentinck, Lady Prescott and family, and the Countess of Derby.

ROMULUS, *rom' u lus*, the legendary first king of Rome and the founder of the city. He and his twin brother Remus were held to be sons of Mars and Rhea Silvia, who was a daughter of Numitor, king of Alba. Amulius, brother of Numitor, who had usurped the Alban throne, ordered that the mother should be buried alive, because she had broken her vestal vows, and that the two children should be thrown into the Tiber. The river, however, received them kindly, and cast them ashore at the foot of a fig tree. Here the boys were found by a she-wolf, who cared for them until they were discovered by the shepherd Faustulus and taken to his home. They were brought up with his children and became strong, handsome young men, fond of sports, but showing in all their superior birth.

Legendary Founding of Rome. One day Remus became involved in a quarrel with the shepherds of Numitor, before whom he was taken for judgment. Romulus came to his rescue, and the bearing of the young man so impressed Numitor that he inquired as to the story of their lives. The secret of their birth being discovered, a plan was made by which the usurper Amulius was driven from the throne of Alba, and Numitor was restored. Soon afterward, the young men decided to build a new city on the Tiber River, at the spot where their lives had been saved by the wolf. They fell into a quarrel as to its exact location, and submitted their dispute to the decision of the

gods; the oracle having decided in favor of Romulus, he began at once to mark out the boundaries of his city with a plow. He turned the furrows inward and lifted the plow to mark the space for his gates, enclosing within the limits the Palatine Hill and a little land at its base. Remus contemptuously leaped over this boundary, saying that such a wall could never protect a city. With the exclamation "So perish whoever shall hereafter cross these walls," Romulus struck his brother and slew him, an act which he instantly regretted.

His new town grew rapidly, for young men came in from every di-

rection. The surrounding tribes looked upon the Romans as little better than outlaws, and refused to allow their daughters to marry them. The dwellers in the new city, therefore, stole wives from the Sabines, with whom they were then forced to go to war (see SABINES). After several conflicts, in which the Romans were successful, the Sabines united with their new neighbors, their king ruling with Romulus. On the death of the Sabine king, Romulus became sole ruler.

One time, after a particularly successful battle with Veii, Romulus was holding a review of his army, when suddenly darkness covered the sky, and a terrible storm arose. About the head of Romulus the lightning played most fiercely, and the people all fled in dismay. When the storm had passed and they returned, their king was nowhere to be found, and they believed that his father Mars had carried him off to the dwelling place of the gods. Under the name of Quirinus (which see), he was worshiped as a deity. See ROME (The Period of Legend).

ROMULUS AUGUSTUS. See ODOACER.

RONCESVALLES, *rone thes vah!' yase*, PASS OF. See CHARLEMAGNE; ROLAND.

ROOF OF THE WORLD. See ASIA (How the Continent is Divided); TIBET.

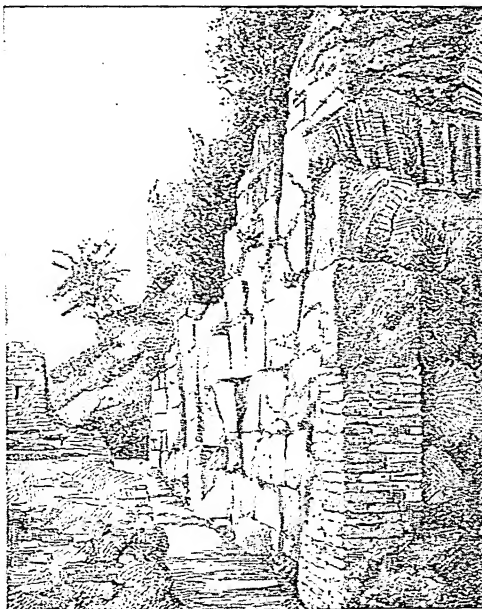
ROOFS. The cover of any building, including the materials necessary to carry and maintain its weight, is included in the term



Photo: Visual Education Service

ROMULUS AND REMUS NOURISHED BY THE WOLF

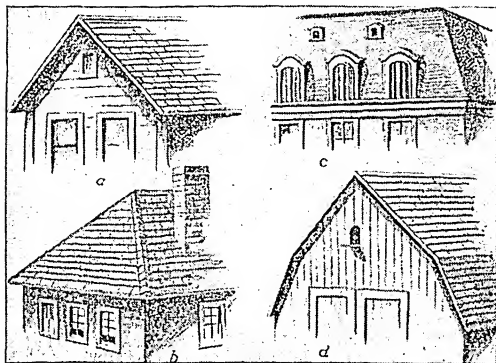
[From the painting by Rubens; the original now hangs in the Capitoline Museum, Rome.]



WALL OF ROMULUS

A part of the wall believed to have been built at the founding of Rome.

roof. As the purpose of roofs is shelter, climate has been a chief factor in their design. The Syrian or Egyptian architect of ancient times looked at the cloudless skies and hot sun; the result was a flat roof, with no slope to lower



FOUR STYLES OF ROOFS

(a) Gable; (b) hip; (c) mansard; (d) gambrel.

the height of the walls of the rooms below. In Northern Europe, where deep snows of winter do not disappear until washed away by spring rains, the sensible architect planned a steep roof, which readily shed snow and rain. From these two simple designs have developed types of roof as diversified as the gable, hip, gambrel, lean-to, mansard, dome, and arch. One of the largest domes in the world is that of the Pantheon in Rome, with a span of 142 feet. Modern railway stations use arched roofs to span wide spaces. Mansard roofs, which have reached greatest architectural perfection in France, are being successfully adapted to modern skyscraper architecture. The slender spire of the Methodist Temple Building in Chicago is as beautiful as the spire of any Gothic cathedral. At night it rises in a glow of light above the building. The very steep-pitched Gothic roof of the Fisher Building in Detroit is considered an architectural achievement.

Greek architectural genius designed roofs of marble and terra cotta; Roman engineering genius devised a method of spanning broad spaces with vaults or domes of brick. But it was the medieval creators of Gothic architecture who developed a ceiling or inner cover of stone vaulting, with an outer coating of boards covered with lead, slate, or tile.

The newly discovered principle was applied only to churches and castles. The cottages of the poor remained thatched. Thrifty peasants used straw or reeds for roofing, and the result was a quaint picture. Thatched roofs are strong and often do not have to be replaced more than once in forty years. The use of thatched roofs in Europe survived long after the Middle Ages, and thatched cottages may be seen there to-day.

The materials for construction of roofs discovered by the Greeks and medievalists are still used, although modern practice has in many cases replaced wood and stone with iron and steel, and modern invention has added to the list of roofing materials asbestos shingles, tar paper, and corrugated iron. Many modern skyscrapers are of monolithic concrete construction. The roof is built exactly as the floors below have been, and is a slab of concrete. See ARCHITECTURE; CARPENTRY.

Terms Peculiar to Roofs. If the height of the roof is one-half the width which it covers, it is said to have *one-half pitch*. Similarly, roofs are frequently one-third pitch, one-fourth pitch, and so on. The horizontal distance from the edge of a roof to a point beneath its peak is called the *run*; the perpendicular height of the peak above the edge is called the *rise*. In a one-half pitch, therefore, the run equals the rise.

ROOK, the most common European member of the crow family, smaller than the raven, and larger than the jackdaw. It differs from other members of its family in having a purple gloss on its black plumage, and in its habit of feeding entirely on insects and grain. Also, on coming to maturity, it sheds the feathers of its face, which leaves it a grayish-white. The migrating habits of rooks vary, those in Central Europe remaining the year round in their settled place of abode, and those farther north flying southward on the approach of winter. At the nesting season, they gather in communities of many hundreds, known as rookeries. When tamed, they sometimes learn to imitate human speech, and are known for their cunning and their thievish ways. The bird figures in English literature from the time of Chaucer. See CROW.

D.L.

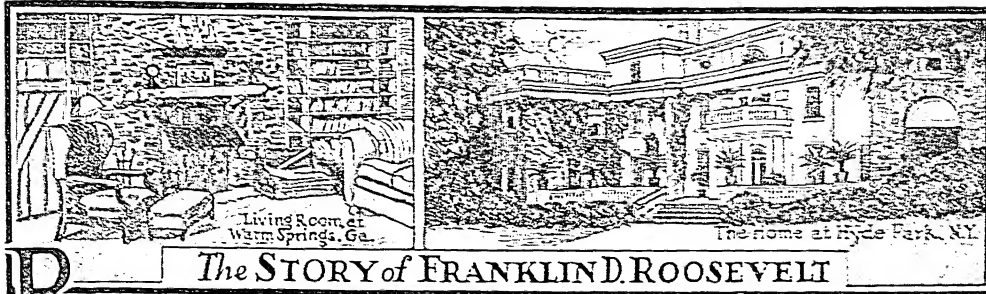
Scientific Name. The rook belongs to the family *Corvidae*. Its scientific name is *Corvus frugilegus*.

ROOKERY. See SEAL (Life Habits); ROOK.

ROOKWOOD POTTERY, a ware that is representative of American ideas and methods in pottery work. The factory, located in Cincinnati, owes its inception to the experiments of Mrs. Bellamy Storer.

Most of the clays used are found in the Ohio River Valley. The first Rookwood ware had a stoneware body and was decorated with slip glaze colors, chiefly in shades of brown and sea-green. The pottery of recent manufacture includes beautiful tints of all the colors.

The products are divided into three classes: cameo ware; dull-finished ware, which is apparently unglazed; and the richly glazed ware. Each kind has won a distinctive place in ceramics. With the exception of the potter's wheel, practically no machinery is employed. An interesting museum at the home of Rookwood pottery contains beautiful and rare pieces representing the development of the manufacture. See the article POTTERY.



R The STORY of FRANKLIN D. ROOSEVELT

ROOSEVELT, *roz'velt*, FRANKLIN DELANO (1882-), inaugurated March 4, 1933, as the thirty-second President of the United States. He is a fifth cousin of Theodore Roosevelt, twenty-sixth President, and his wife, Anna Eleanor Roosevelt, is the daughter of Theodore Roosevelt's only brother, Elliott.

Franklin D. Roosevelt comes from Dutch, Flemish, and English stock which dates back to early colonial days. He was born on January 30 in Hyde Park, Dutchess County, N. Y., the only son of James Roosevelt by his second wife, Sara Delano Roosevelt. James Roosevelt was a railroad executive and gentleman farmer. Sara Delano was a member of an old New England ship-owning family. Young Franklin Roosevelt received his early education from tutors in this country as well as in Germany and France, and thereafter attended Groton School, Harvard University, and Columbia University Law School. Tall, handsome, energetic, and of pleasing personality, he distinguished himself by his variety of interests and his ability to obtain the coöperation of his friends in anything he undertook.

Early Political Career. In 1907, Roosevelt was admitted to the bar and began the practice of law with one of the leading firms in New York City. He began his political career in 1910 as the Democratic candidate for state senator from his district along the Hudson River. This was a year in which a wave of liberalism swept the country, presaging the split between President Taft and Theodore Roosevelt and the Progressive movement of 1912. The Hudson River counties were overwhelmingly Republican; no Democrat had been elected from Franklin Roosevelt's state senatorial district in fifty years. But the Hudson River Roosevelts had always been Democrats, and young Roosevelt set out vigorously to prove to skeptical politicians that he could be elected. He broke a precedent by making a whirlwind house-to-house campaign in an automobile, which was then considered a highly unpopular invention among the farmers, and to the surprise of the politicians he was elected.

In the New York legislature Roosevelt instantly attracted nation-wide attention by his formation of an insurgent *bloc* of twenty

Democratic legislators to oppose the election of William F. Sheehan to the United States Senate. Sheehan was the choice of Tammany Hall. Finally Sheehan withdrew and Roosevelt agreed to a compromise candidate.

In spite of strong opposition from the Old Guard, Roosevelt was renominated and re-elected in 1912. He was unable to make his own campaign because he was stricken with typhoid fever. His victory was significant for two reasons.

First, because it again proved his hold on the Republican voters of his district, most of whom were farmers. Second, because it was partly the result of a strong friendship which was destined to have an important influence on the future history of the nation. When her husband became ill, Mrs. Roosevelt sought the assistance of a newspaperman whom they had met



Photo: C. Martin Yon

FRANKLIN D. ROOSEVELT

at Albany, Louis McHenry Howe. Howe conducted the successful campaign. Soon afterward he became Roosevelt's secretary and counselor. He was determined that some day his friend should be President.

Assistant Secretary of the Navy. As the Presidential campaign of 1912 drew near, Roosevelt was attracted by Woodrow Wilson. Again defying Tammany Hall, he organized the Wilson movement in upstate New York and worked for Wilson's nomination and election. He was rewarded for his work with the post of Assistant Secretary of the Navy in the Wilson administration. He instituted several notable reforms, including the conversion of useless navy yards into factories and the improvement of the method of buying supplies. With the entrance of this country into the World War, he became largely responsible for obtaining munitions and for expediting the naval build-

ing program. He was also largely responsible for two of the most effective weapons used by the American Navy against the submarine: the 110-foot "sub-chasers" and the North Sea mine barrage, both of which were at first deemed impractical by leading naval experts.

In 1918 Roosevelt inspected the far-flung American naval establishment in European waters, and he returned to Europe after the armistice to supervise naval demobilization.

In 1920 Roosevelt was fully established as one of the most promising younger Democrats in the country, and he was nominated for Vice-President on the ticket headed by Governor James M. Cox of Ohio. After their defeat in the Harding landslide, Roosevelt returned to private life. In the following summer, at the age of thirty-nine, he was stricken with infantile paralysis. Both his legs were left paralyzed, and his political career apparently was at an end. But Roosevelt refused to surrender. He began a long, dogged fight for the recovery of his health and the use of his legs. He found that he was benefited by exercising in the waters at an old summer resort at Warm Springs, Ga. After extensive experiments he bought the place and developed it as an institution for the treatment of crippled persons.

Governor of New York. From the time of his illness until 1928, Roosevelt's chief political activities were directed toward the election of Alfred E. Smith to the Presidency. Twice he placed Smith in nomination before a Democratic National Convention. In 1928 Smith insisted that Roosevelt run for governor of New York. Roosevelt was reluctant because he wanted a few more years to devote to the recovery of the use of his legs, but he finally accepted the nomination. He was elected by a plurality of 25,000.

As governor, Roosevelt applied the liberal principles for which he had consistently stood. He established stricter regulation of public utilities, created a power authority to develop the water power of the Saint Lawrence River, modernized the penal system, established old-age pensions, began the simplification of the administration of justice, and put into effect a comprehensive program for farm relief, reforestation, and the better use of the land. After the depression came, he established the first state system of unemployment relief.

In 1930, Roosevelt was reelected governor by the unprecedented plurality of 725,000. He carried counties that had not gone Democratic since the Civil War. To his reputation as the outstanding Liberal in the Democratic party, this victory added convincing proof of his popularity with the voters.

The movement to nominate him for the Presidency spread rapidly in the South and the West, where his farm relief program and progressive policies had made a deep impression.

Over the opposition of the conservative Democrats of the East he was nominated for the Presidency on July 1, 1932, on the fourth ballot at the Democratic National Convention in Chicago. Beginning with his spectacular airplane trip to address the convention while it was still in session, Roosevelt waged an aggressive campaign which took him into thirty-eight states. In the election he carried all but six states and defeated President Hoover by the electoral vote of 472 to 59 and by a popular plurality of nearly seven million votes.

Profound discontent nurtured by the worst economic depression in the history of the nation swept Roosevelt into the Presidency. During his campaign he pledged himself to measures designed not only to lift the country out of the depression but to remedy the basic defects in our economic system which had resulted in the depression. Since its beginning near the end of 1929, the depression had steadily deepened. Between twelve and fifteen million industrial workers had no jobs. The severe drop in the prices of farm products had reduced almost one-half of the population of the country to a level of bare subsistence. Millions of farmers and city workers had lost, or were about to lose, their homes because they lacked money to pay taxes and interest on their mortgages. About three weeks before Roosevelt's inauguration a banking panic began in Michigan. It spread rapidly throughout the country as anxious depositors besieged their banks to obtain cash and gold. The panic reached its final crisis on the day before Roosevelt's inauguration. On the morning of March 4, 1933, nearly every bank in the country was closed or was permitting the withdrawals of only small amounts of cash.

Administrations as President. In his first inaugural address, Roosevelt promised vigorous action; and the nation did not have to wait for it. His cabinet—in which Progressive Republicans as well as Democrats were represented—was confirmed and sworn in with unprecedented speed. Late the following night, Roosevelt issued a proclamation closing all the banks in the nation, prohibiting the export of gold, and requiring all the gold coins in the country to be deposited at once. He also called the new Congress into extraordinary session on March 9. On that day, Roosevelt submitted, and Congress promptly passed, an emergency banking act. This act required all gold coins and gold notes to be deposited with the Treasury and empowered the Treasury to license sound banks to reopen. On the following Monday the reopening of the banks began. Depositors swarmed into the banks to deposit the gold and currency which they had withdrawn only a few days before. The banking crisis had passed.

Roosevelt had already begun to send other

important bills to Congress. Congress remained in special session for ninety-nine days, and in that period it passed more far-reaching legislation than any previous Congress.

Probably the two most far-reaching measures were the Agricultural Adjustment Act and the National Industrial Recovery Act.

The Agricultural Adjustment Act, which was the basis for the Agricultural Adjustment Administration, had three main parts. It provided a means for increasing the prices of several of the most important farm crops by the payment of cash benefits to the farmers for reducing their production of these crops and through marketing agreements which might fix the prices paid to the farmer. In the second place, it provided assistance for farmers who were in danger of losing their farms through foreclosure. In the third, it gave the President broad discretionary powers to manage the currency, including the power to reduce the gold content of the dollar, to issue non-interest bearing notes up to a total of \$3,000,000,000, and to coin silver under certain conditions. With the President's agreement to accept these powers over the currency, the dollar sank in terms of foreign currencies, the prices of many commodities rose, and the nation felt a sharp burst of economic recovery.

The NIRA authorized: (1) "codes of fair competition" by industrial and business groups and guaranteed labor the right to organize; and (2) the expenditure of \$3,300,000,000 on public works to stimulate recovery.

Under the NRA, which was administered by General Hugh S. Johnson, came the celebrated "Blue Eagle" campaign in the summer of 1933. Pending the adoption of a code by his particular line of business, every employer was asked to sign the President's re-employment agreement which established minimum wages and shortened the working week. An overwhelming majority of the employers of the country co-operated. Within a year most industries were under codes which established a minimum wage scale and maximum hours, abolished child labor, and eliminated various trade practices.

Among other important results of the special session of 1933 were: (1) the Civilian Conservation Corps, employing some 300,000 young men and a smaller number of World War veterans and Indians in improving the nation's forests, parks, and public lands; (2) Federal aid for home owners threatened with the loss of their homes through mortgage foreclosures; (3) a Federal Co-ordinator of Transportation to attack the complex problem of putting the railroads on their feet; (4) The Tennessee Valley Authority Act, providing for the harmonious development of the resources of the Tennessee Valley under Federal auspices; (5) a system of insurance for small bank deposits and various reforms in the banking system;

(6) the first Federal relief appropriation for the unemployed; (7) the Securities Act, making persons who issue and sell securities responsible for telling the whole truth; (8) annulment of clauses in public and private contracts requiring payment in gold. In December, 1933, the Eighteenth Amendment was repealed.



Photo: Acme

PRESIDENT AND MRS. ROOSEVELT RETURNING FROM
THIRD-TERM INAUGURAL CEREMONIES

During the winter of 1933-1934, the Federal relief program was expanded and the temporary Civil Works Administration employed 4,000,000 persons. In 1934, important legislation included: (1) the Gold Reserve Act, placing the entire gold supply of the country under the Treasury's control (by presidential order the gold content of the dollar was reduced); (2) new farm legislation, including compulsory control of cotton and tobacco production; (3) the Securities and Exchange Act, placing the securities exchanges under supervision of a new Federal agency; (4) the Federal Housing Act, creating a loan-insurance system to stimulate the flow of private money into housing.

The 1935 session of Congress added to the New Deal program: (1) the Social Security Act, establishing unemployment compensation and old-age insurance systems and aid for indigent aged, the blind, crippled children, and other handicapped groups; (2) the National Labor Relations Board, to protect the right of collective bargaining; (3) legislation regulating public utility holding companies; (4) a special commission to regulate the bituminous coal industry; (5) a \$4,000,000,000 work-relief program, out of which came the Works Progress (now Projects) Administration, Rural Resettle-

ment Administration, Rural Electrification Administration, and National Youth Administration; (6) higher taxes on large incomes and estates. See SOCIAL SECURITY ACT.

On May 27, 1935, the Supreme Court invalidated the NRA code system. The original NRA already had broken down, but the Supreme Court's decision seemed to forbid its continuation even in a limited form. On January 6, 1936, the Court invalidated the AAA crop control system. On June 1, 1936, it invalidated the Guffey act regulating the bituminous coal industry.

The 1936 Congress circumvented the Court's AAA decision with a new farm program based on payments to farmers for soil conservation. It also passed a heavy tax on undistributed earnings of corporations; the Robinson-Patman bill to protect independent merchants from chain stores; and, over the President's veto, the \$2,000,000,000 soldiers' bonus bill.

The President was overwhelmingly re-elected in 1936, receiving 523 votes. Because of the extreme judiciary reorganization controversy, the 1937 Congress adjourned in August with only one important administration law enacted, providing Federal aid for low-cost, local-government housing projects. The President instituted various measures to balance the budget. In 1938 new housing, and farm bills, the Fair Labor Standards Act, and the Government Reorganization Bill were passed.

Legislation in 1939 included the Hatch Political Activity Act, in the interest of clean politics. In 1940, legislation of major importance included the Investment Company Act, providing for the registration and regulation of investment companies; the Wheeler-Lea Transportation Act, which extended the Interstate Commerce Act to additional types of carriers; the \$500,000,000 Export-Import Bank Act, to provide for economic aid to other countries in the Western Hemisphere; and numerous acts connected with national defense, including legislation providing for selective military service.

In 1940 President Roosevelt was re-elected for a third term, the first president in the nation's history to enjoy this distinction.

Foreign Relations. In 1933 diplomatic relations were resumed with the Soviet Union. A year later Congress prohibited the export of munitions to warring nations. The Neutrality Act of 1939 substituted cash-and-carry provisions for the arms embargo. In November, 1941, the sections of the Act restricting United States vessels to noncombatant zones and forbidding them to carry guns were repealed.

After setting a precedent in 1939 by entertaining King George VI and Queen Elizabeth, President Roosevelt set another in August, 1941, when he met Prime Minister Churchill on a battleship somewhere in the Atlantic. At this historic meeting was drawn up the "Atlan-

tic Charter," an eight-point presentation of the peace aims of the two nations. Following the unprovoked Japanese attack on Pacific island possessions of the United States on December 7, a date "that will live in infamy," the President delivered a personal message to Congress and war was declared against Japan, and on December 11, against Germany and Italy. In 1942 and 1943, he was host to Prime Minister Winston Churchill on several occasions, and to other high-ranking foreign officials. He toured war plants and military installations in September, 1942, and in April, 1943, on the latter trip conferring with President Manuel Avila Camacho in Mexico. In early 1943, he flew to Casablanca (which see) for a war conference, and visited Presidents Barclay of Liberia and Vargas of Brazil. He proposed a postwar social and economic plan and acted to curb inflation.

See SUPREME COURT; UNITED STATES IN WORLD WAR I; WORLD WAR II.

Anna Eleanor Roosevelt (1884-), daughter of Elliott Roosevelt and niece of the famous Theodore, married Franklin D. Roosevelt in 1905. She is a descendant of Chancellor Robert R. Livingston, famous Revolutionary statesman. She was educated by private tutors. She is associate principal of the Todhunter School for Girls in New York City, where she taught history and current events until becoming mistress of the White House. She established the Val-Kill Shop in Hyde Park, N. Y., for making early American furniture. Beginning in 1920, she took an active part in Democratic politics.

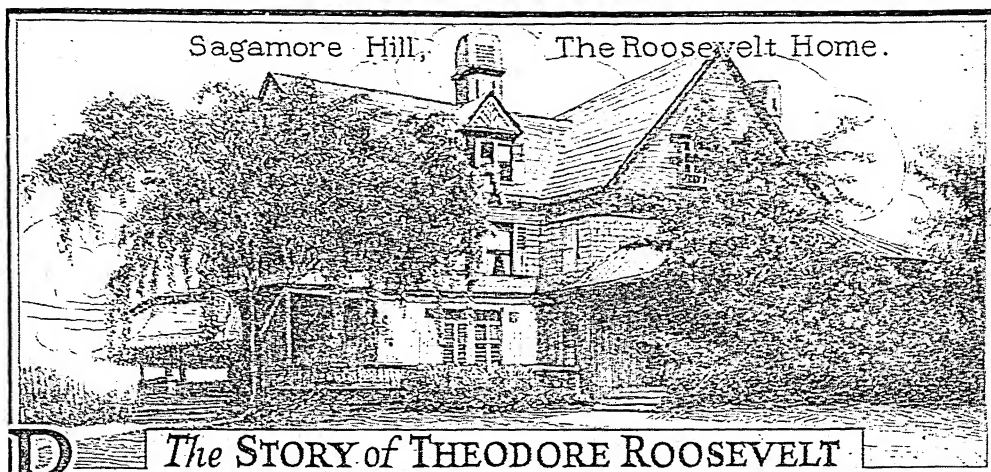
In October, 1942, she flew to Great Britain to gain information on the conduct of the war. Her publications include *This Is My Story*; *This Troubled World*; and a syndicated column, "My Day." The Roosevelt children are: Anna Eleanor (Mrs. John Boettiger), James, Elliott, Franklin D. Jr., and John. E.K.L.

ROOSEVELT, NICHOLAS J. (1767-1854), inventor of the vertical paddle wheel for steamboats. He was born in New York City, and was the great-granduncle of Theodore Roosevelt. In 1797 he attempted to build a steamboat in co-operation with R. R. Livingston and John Stevens. This failed, and lack of money prevented Roosevelt from carrying out his ideas before Robert Fulton's steamboat was launched in 1807. The two, however, became partners in 1809, and in 1811 a boat built by Roosevelt steamed down to New Orleans.

ROOSEVELT, QUENTIN (1897-1918), the youngest son of Theodore Roosevelt, was killed in France. See illustration, page 6194.



ANNA ELEANOR ROOSEVELT



R The STORY of THEODORE ROOSEVELT

ROOSEVELT, THEODORE (1858-1919), the twenty-sixth President of the United States, a unique figure in his generation, without doubt the most versatile man who has ever influenced American public life, and the most interesting political figure of his time in the world. An eager seeker for knowledge of all kinds, Roosevelt won distinction in many fields. Not merely must he be called a statesman, for he was always a reformer; and he was also a naturalist, a man of letters, a hunter, and a sportsman. He stands in American thought as the representative of many of the great advances which his generation made, and to an extraordinary degree, his personality has impressed itself on the American people. He was an advocate of a busy life, the "strenuous life," it has been called. "Speak softly and carry a big stick" is a motto which will always be associated with him, just as conservation and opposition to race suicide and to nature-faking will be.

As a man of letters, Roosevelt took high rank for the excellence of his work, both in style and content. As a statesman he is too close to the men who want to judge him to receive fair treatment. First of all, he knew how to handle men—he was a very clever politician. But he was also a statesman, for he had vision, and the courage to make the visions real. John Morley, the English writer and statesman, returning to England after a visit to America, said that he saw two tremendous forces of nature while he was away:

One was Niagara Falls, and the other the President of the United States, and I am not sure which is the more wonderful.

For a quarter of a century, Roosevelt was the storm center of political controversy, and at his death there was but one universal opinion of the man. This was well summarized by a powerful newspaper antagonist on the day

after the great man's funeral, in proposing a national Roosevelt memorial:

The bitter animosities he aroused during his lifetime are dead, not so much because he is dead, too, as because they never had any real life in them. It was a curious thing, and often noticed, that whenever he ceased, for even a short time, to be active in the public mind, animosity died away, and his most virulent enemies began to talk kindly of him. That phenomenon was observable, for instance, when he disappeared in the South American wilds. When he got back and plunged into political controversy again, animosity returned to life. This makes it plain that the enmities he aroused were the enmities of a fighting man, and could last only while he was delivering and receiving blows. When he was not actually in a fight, it was impossible to resist his charm.

No more striking characterization of the aggressive qualities of the man could be given than that delivered in a single sentence by Vice-President Marshall, when Roosevelt's death was announced:

Death had to take Roosevelt sleeping, because if he had been awake, there would have been a fight.

His Ancestry. Roosevelt was born in New York City, October 27, 1858, and died January 6, 1919. He was descended on the male side from a sturdy family of Dutch burghers, one of whom emigrated from Holland to New Amsterdam about 1650. For a century the Roosevelts (originally Van Rosenvelt) contracted no marriages outside their own nationality, and not until after the Revolutionary War did they begin to use English names in place of the Jacobus, Johannes, and Nicholas which were borne by the earlier members. The Roosevelts prospered. One owned real estate, others went into business, and before long they were numbered among the aristocracy of old New York.

Theodore Roosevelt, the President's father, was a successful business man who gave largely of his time and money to philanthropic enter-

prises of many kinds. His many generous activities were recognized by his appointment to the New York State Board of Charities. President Hayes nominated him for collector of the port of New York, but the elder Roosevelt's

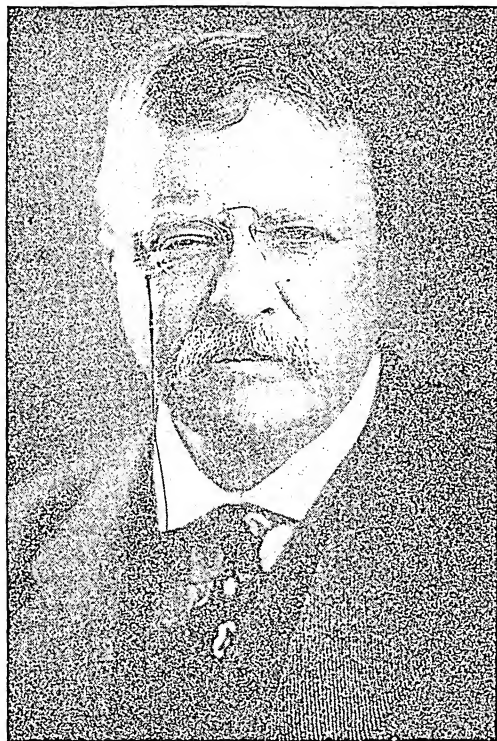


Photo: U & U

THEODORE ROOSEVELT

The millions who believed in him called him "Teddy." His opponents called him many things. His intense activity made a neutral viewpoint almost impossible. Almost every person was either an enthusiastic supporter of Roosevelt or violently opposed to him.

independence in politics led the local bosses to bring influences to bear which secured his rejection by the Senate. President Roosevelt's father and his Uncle Robert (1829-1906) were both active in politics, and their lives were "a stirring summons to men of wealth, of culture, and of leisure, to a more active participation in public affairs." The President's mother, who was Miss Martha Bulloch, belonged to a family as distinguished in Georgia as the Roosevelts were in New York. Mrs. Roosevelt's elder brother was a Confederate naval officer who was responsible for setting afloat the *Alabama* and other privateers and blockade-runners, and a younger brother was navigating officer of the *Alabama*. Her great-grandfather was the first governor of Georgia after the Declaration of Independence was signed.



His Boyhood and Youth. Of a distinguished, aristocratic, and wealthy family, young Roosevelt had many advantages in life. He had, however, the serious handicap of poor health, against which he had to fight until he reached manhood. As a boy he took all manner of gymnastic exercises, some of which seem to have carried him out on window ledges, to the alarm of the neighbors. But his mother used to say, "If the Lord hadn't taken care of Theodore he would have been killed long ago," and Theodore himself said in after years that he had made up his mind that, come what might, he would make himself strong. His schooling was occasionally interrupted by his weakness or by illness, but he made excellent progress, nevertheless, and entered Harvard in 1876.

At Harvard he was neither a "sport" nor a "grind." He belonged to exclusive societies, but also had many friends outside these small, select groups. He stood fairly well in his studies, but had ample time for boxing, wrestling, tennis, and other sports. He was especially interested in natural history.

His Choice of a Career. After graduation from Harvard, young Roosevelt studied law at Columbia University and in the office of his uncle, but it seems that he had no serious intention of becoming a lawyer. The law was merely one kind of preparation for wider activities. At one time he wanted to be a professor of natural history, but he had no thought of becoming a professional writer. The year after he left college, he wrote one book, *The Naval History of the War of 1812*, but he had done this rather to correct a number of errors which he had found in the histories dealing with that war. He made his entrance into politics in 1881, much to the amusement of his Fifth Avenue friends, who told him he would meet only the grooms and saloonkeepers in politics, to which Roosevelt replied that "as they are the governing class in this city, they must be better men than you are." He attended the meetings of the Republican ward club, and found that "the boys there were a jolly enough lot."

In the New York Legislature. In the autumn of 1881, Roosevelt was elected to the New York assembly. He was only twenty-three years old and the youngest man in the legislature, but he was soon one of the best-known both inside and outside of that body. There was a scandal concerning a certain judge. The political bosses ordered silence, but Roosevelt pressed the issue, and after a week of talking, secured the impeachment of the judge. Roosevelt was reelected for three more terms. In 1883 he received the vote of the Republicans for speaker, an honor which made him the leader of the minority. Be-

fore long, however, the bosses found that "he would not listen to reason," and they found a new leader. Roosevelt himself said that this sudden desertion taught him his first real lesson in politics:

It was just this: if you are cast on a desert island, with only a screw-driver, a hatchet, and a chisel to make a boat with, go make the best one you can. It would be better if you had a saw, but you haven't. So with men. There is a point, of course, where a man must take his stand alone and break with all for a clear principle, but until it comes, he must work with men as they are.

Although defeated for speaker, and in disfavor with the bosses, Roosevelt was the most influential man in the assembly, and was already a power to be reckoned with. In 1884 he refused to accept another nomination for the legislature, but he attended the state Republican convention, which by shrewd tactics he and his friends managed to control. He was elected a delegate at large to the national convention, and the other delegates made him, a young man just twenty-five years old, the chairman of the delegation from the Empire State. Theodore Roosevelt was a national figure. He worked hard to secure the nomination of George F. Edmunds for President, and bitterly opposed Blaine, but after Blaine was nominated, Roosevelt finally decided to vote for him.

Ranch Life. The year 1884 was a hard one for Roosevelt. His mother died in February; and two days later, his wife passed away. He had married, in 1880, on his birthday, Miss Alice Lee, of an old Boston family. These domestic sorrows and his political defeats turned his mind from politics. He had previously enjoyed many camping experiences in the Maine woods, but now he turned to the Western prairies. He bought a ranch on the Little Missouri, in North Dakota, and made ranching his business. The brand of his Elkhorn Ranch, as he called it, was the Maltese cross. The young master of Elkhorn Ranch—courageous, frank, ready to bear his share of work and hardship—soon won the respect of the hard men of the Bad Lands. They forgave him his aristocratic ancestry, his New York manners, his Harvard English, his gold-rimmed eyeglasses, and even his fringed Angora "chaps," of a kind seldom seen except on the stage. Once he said to a braggart who boasted of the number of men he had killed, "Jim, I like you; but you are the nastiest-talking man I ever heard." And Jim, instead of drawing a gun, admitted apologetically that "mebbe I have been too free with my mouth."

Back in Politics. Roosevelt spent the winters of 1884-1885 and 1885-1886 in New York, so he was not entirely out of touch with political affairs. He spent his vacations on the Elkhorn Ranch for a few years more, but his

active ranching career ended in the autumn of 1886. He was at Elkhorn when the Independents and the Republicans nominated him for mayor of New York. Opposing him were Henry George, the Single-Taxer, and Abram Hewitt, the Democratic candidate. There was little chance of election, but Roosevelt conducted a lively canvass and felt no disappoint-

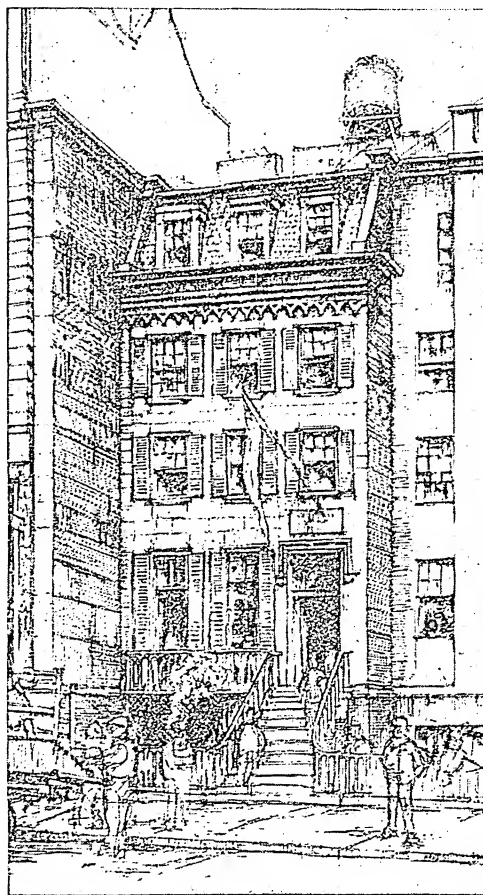


Photo: P & A

BIRTHPLACE OF THEODORE ROOSEVELT

The building, 28 East 20th Street, New York City, has been restored by the Women's Roosevelt Memorial Association, named Roosevelt House, and made a permanent memorial and museum of Americanism.

ment when Hewitt was elected. In December following this defeat, Roosevelt married Miss Edith Kermit Carow, a childhood friend.

After a honeymoon in Europe, Roosevelt returned to New York and renewed his political connections. In 1888 he went on a speaking tour for Harrison, who rewarded him by giving him a place on the Civil Service Commission. While Roosevelt was a member, the Commission adopted many measures aimed to bring public employment within reach of the people

of all sections and of all parties. It began the practice of holding examinations throughout the country for clerkships in Washington, and greatly extended the scope of the civil service on the basis of "applied idealism," as Roosevelt called it.

President of the New York Police Commission. After serving on the Civil Service Commission from 1889 to 1895, Roosevelt resigned to become president of the police board of New York City. For the next two years, he labored to eradicate corruption from the police force, and to secure enforcement of the laws. Roosevelt was only one of four members of the board, but he was held responsible by the public for its entire work. He stopped the system, hitherto recognized, by which police officers won promotions by paying money to "the man higher up." Roosevelt was not a mere desk official. He kept in touch with the men on the streets, and any policeman might expect that at the next corner he would find himself face to face with his chief. At midnight or in an early hour of the morning, the chief would sometimes appear and ask questions. It was at this time that the cartoonist first introduced to national attention his familiar shining teeth. A scared policeman, "seeing things at night" in the form of two rows of teeth glistening in the darkness, was a favorite subject for cartoonists.

In the Navy Department. In April, 1897, President McKinley recalled Roosevelt to Washington to become Assistant Secretary of the Navy. Roosevelt already foresaw the likelihood of a war with Spain, and he set about to put the navy in readiness. One of his first tasks was the reorganization of the system of ranking and promotion among naval officers. Target practice was one of his hobbies. To Roosevelt belongs most of the credit for whatever preparedness the American navy possessed when the war broke out. But when the war actually came, Roosevelt gave his services to the nation in another capacity.

The Rough Riders. He resigned from the Navy Department in April, 1898, after he had taken the initial steps to raise the first United States Volunteer Cavalry, which was nicknamed "the Rough Riders." These riders were a remarkable lot. Most of them were plainmen—cowboys. There were Cherokee Bill, Smoky Moore, Rattlesnake Pete, Happy Jack, and others with interesting names. There were a few Indians, and an ex-city marshal from Dodge City, Kan., whose ear had been "bitten off," as he explained. A sharpshooter from the Carolina mountains and a bear-hunter from Wyoming rode side by side with "cow-punchers," stage-drivers, and miners. And there was McGinty, a famous "broncho buster," who could not keep step on parade, for the simple reason that he had almost forgotten how to walk. There was, too, a sprinkling of Eastern-

ers, many of them college men, and there were New York policemen, eager to serve again under the ex-commissioner.

Of the motley crowd, Roosevelt was at first lieutenant colonel; Leonard Wood was colonel. Later, when Wood was made a brigadier general, Roosevelt took the command, and at the head of the regiment, he led the famous charge up San Juan Hill, a charge which made the Rough Riders immortal and made Roosevelt a popular idol.

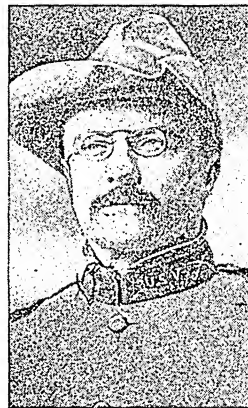


Photo: F & A

AS A SOLDIER

Roosevelt in the uniform of a lieutenant colonel in the Spanish-American War.

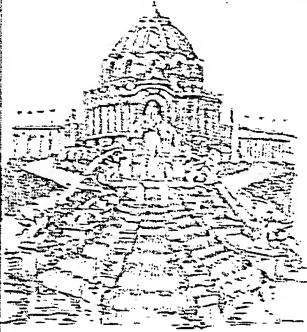
Roosevelt as a savior. Without attempting concealment, Roosevelt discussed the matter with Platt, much to the alarm of some reformers, who feared needlessly that he might be led astray. Roosevelt was nominated without giving pledges, and was elected by a plurality of 18,000 votes over the Democratic candidate, Augustus Van Wyck.

As governor he made a remarkable record. He worked with men of all kinds, reformers as well as machine politicians, and in almost every case got what he wanted. He directed an investigation of the state's canal system, about which there had been much talk of fraud, and persuaded the legislature to vote an appropriation for a systematic survey of needed improvements. He incurred the hostility of large corporate interests by approving a bill providing for the taxation of corporation franchises. Far from obeying the orders of the "machine," Roosevelt had made the "machine," in most instances, do as he wished. He, too, was a politician, he knew how to handle men and issues, but he did it honestly. Yet he was too troublesome a man to be endured in places of power, and the politically powerful determined to render him harmless by making him Vice-President, that office being a political tomb from which no man had emerged with power for half a century. Senator Platt later asserted openly that he got rid of Roosevelt by forcing him to accept the nomination for Vice-President. By the irony of fate, this act was responsible for his becoming President.

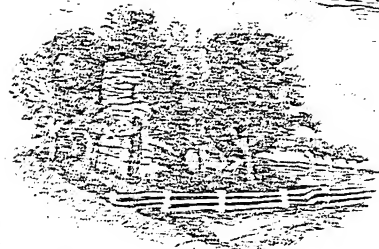
ROOSEVELT'S ADMINISTRATIONS

1901 1909

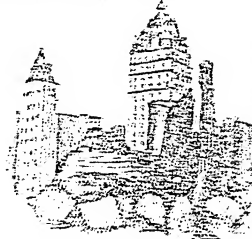
Navy Goes Around the World



Louisiana Purchase
Exposition



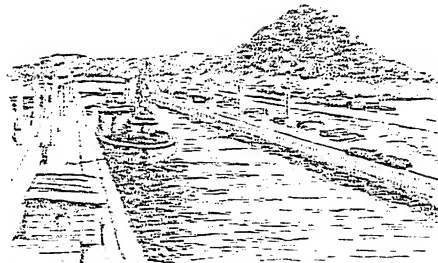
Jamestown Exposition,
Commemorating Old Jamestown



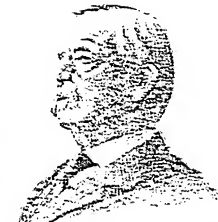
San Francisco
Disaster



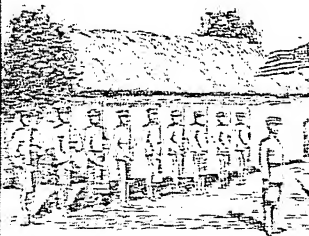
Pacific Cable Laid



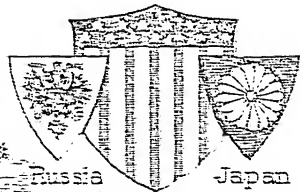
Panama Canal Started



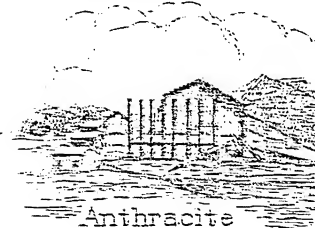
Cleveland Died 1908



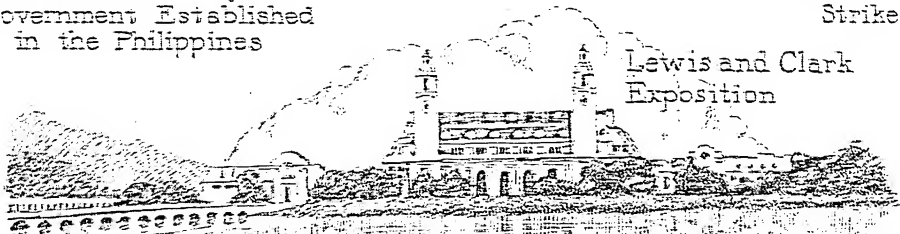
Government Established
in the Philippines



Russia Japan
Treaty at Portsmouth



Anthracite
Coal
Strike

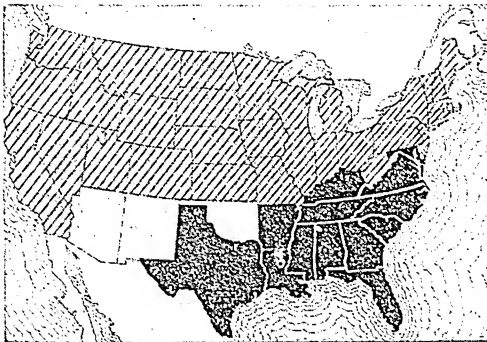


Lewis and Clark
Exposition

Roosevelt wanted to be governor of New York for a second term, but he finally agreed to accept the Vice-Presidency, for which the Republican convention nominated him by acclamation. In the campaign, Roosevelt took an important part; he delivered nearly 700 speeches and contributed largely to the success of the ticket. McKinley and Roosevelt received 292 electoral votes to 155 for Bryan and Stevenson.

The Administration of Theodore Roosevelt

Six months after his inauguration as Vice-President, Roosevelt became President of the United States through the assassination of William McKinley. He was only forty-three years old, the youngest man who has ever become President. President Roosevelt retained the



ELECTION MAP OF 1904

States marked with lines gave their electoral votes to Roosevelt; states appearing in solid black were Democratic, supporting Parker. The light areas north of Mexico were then non-voting territories.

late President's policies. McKinley's plans for trust regulation, for reciprocity with other countries, for government of the Philippines, and for other policies were all advanced. So striking was the President's personality, so tremendous his influence, that his character was the chief issue in the campaign of 1904. The President said frankly that he wanted to be elected to serve a full term. He was nominated by the Republican convention by acclamation, and his election was a foregone conclusion. He defeated Judge Alton B. Parker, the Democratic candidate, by a popular majority of nearly 2,000,000 votes, and received 336 electoral votes to 140 for Parker. In his second administration, he pursued in a general way the policies outlined during his first term, and the seven years and six months for which he was President constitute a single unit.

Important Legislation. During the whole of his two terms, President Roosevelt wielded a tremendous influence on Congressional legislation. He advocated a larger army and navy,

and one of the first important laws passed reorganized these two services. A general staff was created for the army in 1903, and a program of more rapid construction was adopted for the navy. About the same time, Congress passed a new Chinese Exclusion Act and the Reclamation Act, the latter providing for the reclamation and irrigation of the arid lands of the West. Congress in 1902 made the Census Bureau a permanent branch of the government, and in 1903 created a new department, that of Commerce and Labor. The Hepburn Railway Rate Act of 1906, the Federal meat-inspection act and a pure-food law of the same year, the establishment of a Bureau of Immigration, a uniform naturalization law, a law increasing the salaries of the Vice-President, the Speaker, and members of Congress, and, finally, the Aldrich-Vreeland Act of 1907—these were the most important laws of Roosevelt's terms. During these seven and a half years, the President's support of many radical reforms alienated the more conservative members of his party, and, especially in the closing years of his term, there was bitter antagonism between them and him.

Foreign Relations. During the whole of President Roosevelt's administration, foreign relations presented many knotty problems. For the most part, these involved South or Central American republics. By far the most important concerned the Panama Canal. The Hay-Pauncefote Treaty was ratified on December 16, 1901. Two years later, after Colombia had rejected a treaty for the construction of a canal, the state of Panama revolted and was immediately recognized as an independent republic by the United States; it promptly granted to the United States the canal rights it sought. There is some evidence that the President was directly concerned in the revolt of Panama, but his action was generally approved by public opinion, and the acquisition of the Canal Zone was without question the greatest material achievement of the Roosevelt administration.

Less important in its results, but more threatening at the time, was the Venezuelan complication. Great Britain and Germany sent a joint naval expedition to force Venezuela to pay certain claims which they held against it. The bombardment of the Venezuelan ports was about to begin when President Roosevelt called on the two powers to submit their claims to arbitration. After tedious negotiations, relations between Great Britain and the United States were further smoothed out by the action of the Joint High Commission in finally disposing of the Alaska boundary dispute. In Santo Domingo, in 1907, the attempt of the European powers to enforce certain claims led the United States to assume a sort of financial protectorate over the island republic, American

officials being designated to collect customs duties and pay Santo Domingo's foreign debts with the net proceeds.

A reciprocity treaty was negotiated with Cuba in 1903. In 1906 an American provisional government was established in that island, as the result of an insurrection. As soon as order was restored, authority was turned back to the Cubans. The most remarkable episode in foreign relations, however, was the President's action in bringing together the Russian and Japanese peace commissioners, and thus being directly responsible for the conclusion of the Russo-Japanese War in 1905. In the next year, the Nobel prize for peace was awarded Roosevelt for his services to the world in ending this war. The successful cruise of an American battleship fleet around the world, and the laying of the Pacific cable to Hawaii and the Philippine Islands, were also of great importance in disclosing the degree of preparedness possessed by the United States. The dramatic voyage of the fleet was conceived and inspired by him, although naval experts predicted disaster for the ships, and its moral effect on the nations of the world was tremendous.

Anti-Trust Movement. One of the most important tendencies of the early years of the twentieth century was the outcry against trusts. President Roosevelt's administration was marked by special activity in this direction, notably against common carriers. As a result of investigations carried on by the Bureau of Corporations in the Department of Commerce and Labor, the government brought suit against the Northern Securities Company, a holding company which owned the controlling interests in the Great Northern and the Northern Pacific railways. The Securities Company was ordered dissolved by the Supreme Court in 1904. Similar suits were instituted and convictions obtained against the so-called "beef trust" and other monopolistic groups. Indictments for receiving or granting rebates were voted against the Standard Oil Company, the New York, New Haven & Hartford Railroad, and other railways and industrial corporations. The air was constantly filled with rumors of further attacks upon "big business," and there was much criticism of the President for the encouragement he was said to be giving to possible industrial and financial disturbances. In fact, in 1907, the country suffered from a sharp financial crisis, which did not, however, leave a serious effect on industry.

Strike of Coal-Miners. Although not directly connected with the anti-trust agitation, a great strike of the anthracite coal-miners in 1902 was symptomatic of the industrial unrest which pervaded the country. The strike lasted the whole summer, and the country faced a coal famine. The miners refused to return to work unless the owners would submit the ques-

tions in dispute to arbitration, but the owners declined to meet those demands. The President, in this crisis, called the representatives of the owners and the miners together in conference. The owners at first declined to consider arbitration, but within two weeks, when the public was aroused at the spectacle of the President's discomfiture, they agreed to it, provided the President would name a commission. The President at once named three men, Judge George Gray, Bishop John L. Spalding, and Carroll D. Wright. This commission decided all questions at issue, and made peace in the anthracite industry.

Other Affairs. Roosevelt's term was marked by three anniversary expositions—the Louisiana Purchase at Saint Louis in 1904, the Lewis and Clark at Portland, Ore., in 1905, and the Jamestown Tercentennial at Hampton Roads, Va., in 1907. In April, 1906, occurred the disastrous San Francisco earthquake and fire, which made 200,000 homeless and caused a property loss of about \$500,000,000.

An event of international importance was the laying of the Pacific cable, the first American cable across that ocean, in 1903. This cable is 7,846 nautical miles long, and touches at Guam, Hawaii, and the Philippine Islands. It was later extended from Manila to Japan and to Shanghai. Oklahoma was admitted as a state in 1907. An interesting event was the adoption by Wisconsin, in 1903, of the first state-wide primary-election law for the nomination of elective officials.

The Election of 1908. It was generally understood that President Roosevelt favored Secretary of War Taft as his successor. Taft was nominated, and was chosen by an electoral vote of 321 to 162 for William Jennings Bryan, his election being due largely to Roosevelt's influence.

The Most Interesting American

African Explorations. The biographies of many Presidents come to a more or less sudden termination as soon as they leave office. This was not true in the career of Theodore Roosevelt. When he retired from the Presidency, in 1909, he was in the full vigor of middle life. He was a few months past fifty, physically and mentally as active as when he began his first term. If ever there was an "apostle of energy," it was Roosevelt. Inactivity for him was impossible.

Immediately after the close of his term, Roosevelt sailed for Africa with a party including his son Kermit and a number of naturalists. The object of the expedition was not merely sport, to hunt big game, but also to secure specimens for the zoological collection of the Smithsonian Institution at Washington. *African Game Trails* is the record he wrote of this year in the wilderness. His return to the

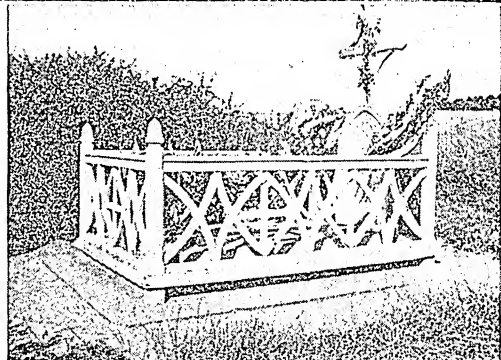


Upper photo: P & A

TOMBS OF FATHER AND SON
Above, the grave of former President Roosevelt at Sagamore Hill, on the family estate. Below, the spot in France where Quentin Roosevelt fell while on duty as an aviator in the World War. He was buried there in a solitary tomb, on a lonely prairie on the road to Château Thierry.

United States by way of Europe in the spring of 1910 was a sort of triumph. Roosevelt delivered lectures at the Sorbonne, in Paris, and at the universities of Berlin, Christiania (now Oslo), and Oxford. He met William II, ruler of the former German Empire, and King George V, and was fêted and honored everywhere.

Breach in the Republican Party. While Roosevelt was away, there occurred the Ballinger-Pinchot controversy. This was merely one of the signs which indicated how widely the radicals and insurgents in the Republican party had become separated from the conservatives. On his return from Africa, Roosevelt at first took no part in politics. Later in the year, however, he made a speaking tour of New York in support of Henry A. Stimson, the Republican candidate for governor, and about the same time, he let it become known that he supported Pinchot, not Ballinger. President Taft had supported Ballinger, one of the circumstances which had made him the leader of the conservative Republicans. Between 1910 and 1912, the breach between the two leaders rapidly widened, Roosevelt continually advocating new and radical reforms, such as the elimination of the "twilight zone" which surrounded the powers of the Federal



government, the introduction of the initiative, the referendum, and the recall of judicial decisions as well as of judges, and a large degree of military and naval preparedness.

Taft, on the other hand, became increasingly conservative, and as the election of 1912 drew near, the struggle between the two elements for control of the party became intense. Roosevelt at first supported La Follette for the Republican nomination, but later sought it for himself, in spite of the two-term custom. The story of the Republican convention of 1912 is told in these volumes in the biography of President Taft. The Roosevelt delegates were unsuccessful in their attempts to get control of the convention. Claiming that the "steam roller" had run over them, that their rights had been ignored, and their votes "stolen" from them, the Roosevelt delegates finally withdrew from the convention, and held one of their own. Out of this secession grew the Progressive

party, which nominated Roosevelt for the Presidency.

The campaign was very bitter, the Republicans and the Progressives both indulging in violent personal attacks on the characters of the candidates. Three weeks before the election, while entering his carriage to deliver an address at Milwaukee, Roosevelt was shot by an irresponsible man, but was not seriously wounded. With characteristic courage, he continued his way to the hall, delivered his address, and then allowed the physicians to take charge of him. For the last weeks of the campaign, Roosevelt lay in a hospital, recuperating. The election showed the former President's amazing strength with the people. The Republican party was split into two sections of nearly equal strength; Roosevelt received 4,126,020 votes; Taft, 3,483,922. Wilson, the Democratic candidate, received the entire vote of his party, polling 6,286,214 votes.

Exploring Again. After the election of Wilson, Roosevelt made an exploring trip into the interior of Brazil. There he discovered a hitherto uncharted river, formerly known as the River of Doubt. It is now called Rio Téodoro, in his honor. In South America, Roosevelt made speeches in several of the larger cities, and helped to strengthen the friendly feeling existing between the two continents.

President Wilson's Chief Critic. Beginning in 1913 and continuing until 1917, when the United States entered the World War, Roosevelt was in the public eye as the chief critic of President Wilson's foreign policy, first toward Mexico and later toward Germany. He objected especially to the "watchful waiting" policy. When the war broke out, Roosevelt at first declared that the United States had no reason for interference, but later he recognized the vast responsibilities resting on the United States. Especially after the sinking of the *Lusitania*, he was vehement in his demands that the President resort to force. His impatience with Wilson's policies led him to support Charles E. Hughes for President, in 1916, though a Progressive convention offered him the nomination again.

When, finally, war was declared against Germany, Roosevelt wanted to lead a volunteer brigade to France, without waiting for the mobilization of the new national army to be raised by conscription. An act of Congress authorized the President to enroll such a volunteer brigade, but President Wilson refused thus to honor the renowned volunteer. It is worthy of note, however, that Roosevelt's four sons all volunteered for service and went to France. Theodore, Jr. (see biography, next article), in France, rose to the rank of lieutenant colonel; Archibald became a captain; Quentin, who chose aviation, was shot down by a German

and buried in France; Kermit, as a captain, served with the British army in Mesopotamia, and with the American field artillery in France.

The Last Year. Roosevelt's health had been seriously impaired on his Brazilian trip, and during the year 1918, he was forced to submit to a serious operation for abscess resulting from infection received on that journey. In spite of his ill health and his grief over the death of his son, he kept up his writing and speaking, and when death took him, in January, 1919, he was anticipating further public service. It was generally expected that he would be the Republican nominee in 1920. His grave, at Sagamore Hill, Oyster Bay, N. Y., is a beloved shrine for Americans.

Roosevelt as Man of Letters. His literary work is of high character, and is itself sufficient to have given him a wide reputation. His writings have been collected in twenty-five volumes, ranging from scholarly historical essays or biological studies to entertaining narratives of his personal experiences. In 1912 he was president of the American Historical Association, and he was the thirteenth man elected to the American Academy of Arts and Letters. He was also a contributor to *The Outlook*, *The Metropolitan*, and other magazines. E.D.F.

Of his many books, the following are most important, some of them being standard works in their respective fields: *The Naval War of 1812*, written in 1882; *Life of Thomas Hart Benton* (1887); *Life of Gouverneur Morris* (1887); *The Winning of the West*, in four volumes, which appeared from 1889 to 1896; *History of New York City* (1890); *American Political Ideals and Other Essays* (1897); *The Rough Riders* (1899); *Life of Oliver Cromwell* (1900); *The Sirenious Life* (1900); *True Americanism*, a collection of his addresses delivered in Europe in 1910; *The New Nationalism*, a discussion of political ideals of the day, a book whose title became a current phrase in popular speech; *History as Literature and Other Essays* (1913); *Theodore Roosevelt, an Autobiography* (1913); *Through the Brazilian Wilderness* (1914); *Life Histories of African Game Animals* (1914); *America and the World War* (1915-1919); *National Strength and International Duty* (1917); *The Great Adventure* (1918). Several editions of his personal letters and his speeches have been published.

Alice Lee Roosevelt, first wife of Theodore Roosevelt, was the daughter of George Cabot Lee of Boston. She died in 1884. Her daughter, Alice Lee Roosevelt, was the "Princess Alice" of the Roosevelt administration; she married Nicholas Longworth, who became Speaker of the House of Representatives in 1925.

Edith Carow Roosevelt (1851-), who married Theodore Roosevelt in London in 1886, was the daughter of Charles Carow of New York City. Five children—four boys and a girl—were born of this marriage. Mrs. Roosevelt was a fitting partner for one of the most energetic and versatile of Presidents. During all of her husband's public life, she managed her household, reared her children, and carried on a social life which would have proved too wearing for a less vigorous woman. But this was not all, for she arranged her life so that she had time to be a close companion and comrade of the famous "T. R." Few

OUTLINE AND QUESTIONS ON THEODORE ROOSEVELT

Outline

I. Years of Preparation

- (1) Ancestry and birth
- (2) Boyhood and youth
- (3) Education
- (4) Law study
- (5) Early political activities

II. A National Figure

- (1) Assistant Secretary of the Navy
- (2) In Spanish-American War
- (3) Governor of New York
- (4) Elected Vice-President

III. His Administration

- (1) Death of President McKinley
- (2) Legislative affairs
 - (a) Reorganization of army and navy
 - (b) Chinese Exclusion Act
 - (c) Reclamation Act
 - (d) Department of Commerce and Labor created
 - (e) Railway Rate Act
 - (f) Bureau of Immigration established
 - (g) Pure-food law
 - (h) Anti-trust legislation

(3) Foreign affairs

- (a) Panama Canal question
- (b) Venezuela controversy
- (c) Santo Domingo
- (d) Reciprocity with Cuba
- (e) Insurrection in Cuba, and American provisional government
- (f) Treaty of Portsmouth
- (g) Cruise of United States fleet around the world

(4) Internal affairs

- (a) Anthracite coal strike
- (b) Expositions
 1. Louisiana Purchase
 2. Lewis and Clark
- (c) San Francisco earthquake and fire
- (d) Laying of Pacific cable
- (e) Admission of Oklahoma

IV. Later Life, and Character

- (1) African explorations
- (2) Breach with Republican party
- (3) Formation of Progressive party
- (4) South American travels
- (5) Activities during the World War
- (6) Character summary
- (7) Publications

Questions

What actions of the President alienated the conservative members of his party during his administration?

What handicaps did Roosevelt have to overcome in his youth?

Why can he be called with justice the "most versatile man who has ever taken a part in American public life"?

In what way, besides his actual participation in the struggle, did Roosevelt help to win the Spanish-American War?

What unusual honor was shown him when he was twenty-three years old? When he was twenty-five?

How did he sum up his ideas of the methods to be employed in dealing with men in politics?

How did the cartoons current during his term as president of the New York police board show his attitude toward his work?

When was he elected to a high office that his party might be rid of him?

When did he, according to good authority, help to foment a revolution, and what was the general opinion concerning his action?

What two exploring trips did he take after his terms as President, and what did he accomplish on each one?

How did his sons carry on Roosevelt traditions in the World War?

How did Roosevelt rank as an author? What were his chief contributions to American historical literature?

Did any son of Theodore Roosevelt enter upon a political career?

other administrations were so full of social events, both official and private. The home and family life of the Roosevelts was so delightful that it is still quoted as an American ideal.

Related Subjects. The reader who desires additional information respecting events connected with the life and times of this President is referred in these volumes to the following articles:

Chinese Exclusion
Conservation
Cuba (History)
Hay-Pauncefote Treaty
McKinley, William
Nobel Prizes
Panama Canal
Pinchot, Gifford
Platt, Thomas C.
Political Parties
Progressive Party
Russo-Japanese War
Spanish-American War
Taft, William H.
Trust
Venezuela (History)
Wood, Leonard
World War



Photo: U & U

EDITH KERMIT CAROW
ROOSEVELT

The mistress of the White House as she appeared during her husband's term of office.

ROOSEVELT, THEODORE, JR. (1887-), assistant Secretary of the Navy during the first term of Calvin Coolidge, is the eldest son of the twenty-sixth President of the United States, whose name he bears. Born at Oyster Bay, Long Island, he studied at Harvard University, as his famous father had done, and was graduated in 1908.

His business career was interrupted by World War I; he went to France as a major with the 26th Infantry, was promoted to the rank of lieutenant colonel, and saw active service at Cantigny, Soissons, the Argonne-Meuse offensive, and Saint Mihiel. He was wounded in action, and received the D. S. C. and D. S. M. (United States), the Legion of Honor and Croix de Guerre from France, and a Montenegrin decoration.

After the war, Roosevelt returned to his business interests, but when he was elected a member of the New York assembly, in 1919, he resigned his several positions on the directorates of corporations. In 1921 he was appointed Assistant Secretary of the Navy, a position he resigned in 1924 to become the Republican candidate for governor of New



Photo: U & U

THEODORE ROOSEVELT, JR.

York, but he was defeated.

In 1925 he accompanied the James Simpson-Roosevelt Expedition to Asia, in behalf of the Field Museum of Natural History. He was an active organizer of the American Legion (which see). He was governor general of Puerto Rico from 1929 to 1932, when he was sent to the Philippine Islands in the same capacity, serving until June, 1933. In 1935 he became an editor with Doubleday, Doran & Company. He served as a brigadier general with the American forces during World War II. Among his works are *Trailing the Giant Panda* (with brother Kermit); and *Colonial Policies of the United States*.

ROOSEVELT DAM. See ARIZONA; DAM.

ROOSTER ROCK. See OREGON (Scenery).

ROOT, in mathematics, a number or quantity which, when multiplied by itself one or more times, produces a given number or quantity. For example, since $2 \times 2 = 4$, 2 is a root of 4; again, since $3 \times 3 \times 3 = 27$, 3 is a root of 27.

Related Subjects. The reader is referred to:

Cube Root	Involution
Evolution	Square Root

ROOT, ELIHU (1845-1937), an American lawyer, statesman, diplomat, and administrator, credited by his fellow citizens with the possession of "the best legal brain in the United States." He became so dependable a lawyer that many corporations willingly paid him thousands of dollars in a single fee for his opinion expressed in one word, "Yes," or "No." His eminence in corporation law earned for him the distrust of those who professed to believe that a man could not serve great private interests and at the same time be true to a public trust. Root's career disproved this implication, for few men ever gave as disinterested service to their country as he, regardless of its effect upon personal fortune.



Photo: Wide World

ELIHU ROOT

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Elihu Root was born at Clinton, N. Y., the seat of Hamilton College, in which his father was professor of mathematics. There the young man received a classical training, after which he was graduated in law at New York University. He earned money for his law course by teaching in Rome (N. Y.) Academy in 1865. Various universities, both at home and abroad, conferred honorary degrees upon him.

He was admitted to the bar in 1867, and began the practice of law in New York City in

the same year. Not until 1883 did he enter public service. In that year he became United States District Attorney for the Southern District of New York, but resigned in two years because the kind of legal service involved was not to his liking. A brief summary of his later public activities includes the following important commissions and honors:

He was a delegate at large to the New York state constitutional convention in 1894, and served as chairman of its judiciary committee. Twenty-one years later, at the state constitutional convention of 1915, at the age of seventy, he was president of that body.

Upon the retirement of Russell A. Alger as Secretary of War in the McKinley Cabinet, in 1899, Root became his successor. He continued in the position under Roosevelt, until 1904. In this office he planned the War College; reorganized the system of administration of the department, instituted the General Staff, and enforced civil-service rules, as far as they can be made practicable, for promotions. Alger left the department in disorder, after the scandals incident to the Spanish-American War; Root was highly praised for the ability with which he restored order and for his administrative genius, which showed in the military plans he laid for the conduct of the armies then stationed in Cuba and the Philippines. While Secretary of War, he served on the Alaska Boundary Commission.

For a year Root practiced law, then in July, 1905, was appointed Secretary of State in the Roosevelt Cabinet, succeeding John Hay. This post was relinquished early in 1909, for he had been elected by the New York legislature as a United States Senator.

He entered the Senate in March, and declared at once his intention not to seek a second term, and accordingly returned to private life in 1915. During his term as Senator, he was counsel for the United States in the North Atlantic fisheries arbitration (1910); was appointed in 1910 as a member of the Permanent Court of Arbitration at The Hague; and in 1913 was made president of the trustees of the Carnegie Institution at Washington. In 1912 he was awarded the Nobel prize for peace (see NOBEL PRIZES).

His next public service was again international in character. In 1917 he became chairman of an American commission to the new republic of Russia, by appointment of President Wilson. It was the delicate duty of the commission to do all possible to unite the discordant elements of Russia for vigorous prosecution of their part in the World War, but the purpose was not achieved. In 1921 Root was an American representative to the Washington conference on limitation of armaments, and in 1926 he was awarded the Woodrow Wilson Foundation medal and prize for his championship of the World Court. In 1929 he went to Geneva, Switzerland, on an unofficial mission to assist in the revision of the statutes of the World Court.

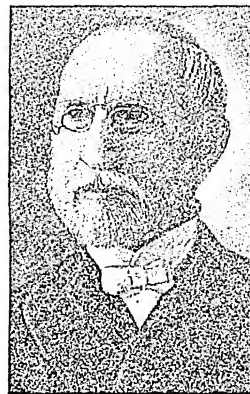
E.D.F.

ROOT, GEORGE FREDERICK (1820-1895), an American composer, remembered chiefly for some of the most stirring songs inspired by the War of Secession. After a period of more than three score years, these songs still live. Root was born at Sheffield, Mass. He studied music in Boston, and in 1844 went to New York City, where for some years he was organist in the

Mercer Street Presbyterian Church. In 1859 he organized the music-publishing firm of Root & Cady, in Chicago, and made a fortune, after

the War of Secession broke out, by publishing patriotic songs.

Some of his most successful compositions are: *Tramp, Tramp, Tramp, the Boys Are Marching*, of which more than 500,000 copies were sold; *The Battle Cry of Freedom*; and *Just Before the Battle, Mother*. His quartet, *There's Music in the Air*, also gained much popularity. His war songs, while not possessing great musical



GEORGE F. ROOT

or literary merit, had a martial swing and came at a time when all efforts to increase American patriotism were cordially welcomed. Among his compositions of a much higher quality were the cantatas, *The Pilgrim Fathers* and *Belshazzar's Feast*.

ROOT GRAFT. See GRAFTING, illustration.

ROOTS constitute one kind of the three vegetative organs essential to plant growth, the others being the stems and the leaves. The chief functions of roots are to hold plants in their places in the earth, and to supply them with water and nutrient salts from the soil. The first-formed roots, those that grow directly from the rudimentary stem, are called *primary*; branches of the primary roots are called *secondary*; and branches of these, *tertiary*. Roots which grow on the stem or in other unusual places are known as *adventitious*. In most cases, the root system branches freely. The smaller rootlets are covered with tiny *root hairs*; the region of root-hair production constantly advances as the root tip grows, but is always about one-fourth inch behind the tip. These root hairs play an important part in the development of the plant, by taking up water from the soil.

According to the medium in which they grow, roots are classified as *soil*, *aerial* (or *air*), and *water* roots. Air roots are sometimes developed by plants which are anchored in the ground, as in case of the poison ivy, but there are other plants which grow entirely in the air, as many kinds of orchids. The water hyacinth and the floating duckweed are examples of plants that have roots adapted to live in water. Roots that derive nourishment from other plants are called *parasitic*; such are the roots of the dodder and the mistletoe. Whatever their location, roots must have oxygen to remain alive. The upper parts of the plant

cannot supply the roots with this essential gas; therefore air must be available through the soil or water.

Roots are also distinguished in regard to form. A primary root which grows to be much larger than any of its branches is called a *tap-*

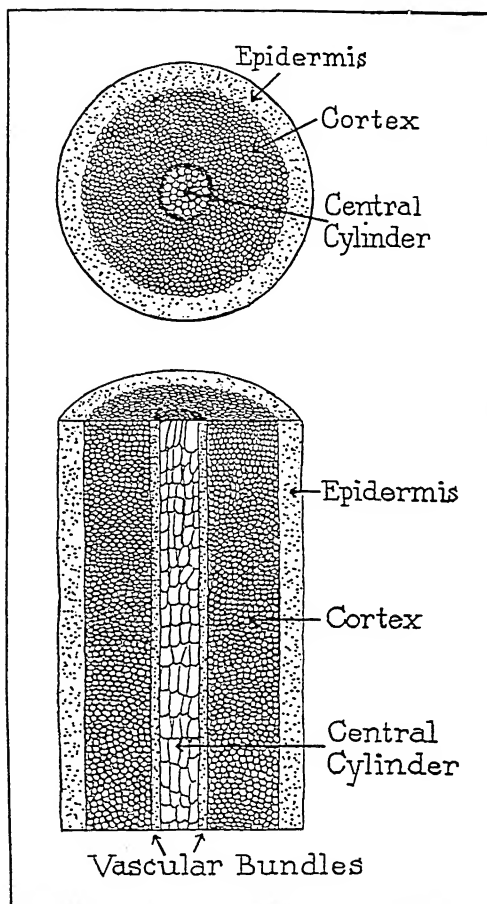


DIAGRAM OF A ROOTSTALK

Cross section above, and longitudinal section below.

root, and if this taproot becomes much thickened and develops as a storehouse for nourishment, as in case of the carrot or turnip root, it is said to be *fleshy*. A cluster of thickened primary roots, such as those produced by the sweet potato and dahlia, would be called *fascicled* roots. Threadlike roots, such as those of grass, are *fibrous*. In regard to their length of life, roots are classified as *annuals*, *biennials*, and *perennials* (terms explained in these volumes under their respective headings).

B.M.D.

Related Subjects. For the picture of a young root system, see **GERMINATION**. In the article **CORN** there is a diagram showing how roots and their branches penetrate the soil. How roots often grow much farther below ground

than the stem does above ground is illustrated under **DANDELION**. See, also, in the article **BOTANY**, pictures of parasitic plants and of fleshy roots.

ROPE. The distinction between a rope and a cord is in the size alone. The term *rope* is applied to a cord one or more inches in diameter, and the term *cordage* to all smaller cords down to the size of binder twine, excepting ropes made of wire. Ropes vary in size from those an inch in diameter to the huge ship cables more than fifteen inches in circumference.

Hemp, abaca, sisal, flax, jute, cotton, and coir, the latter being the fiber from the husk of the coconut, are the materials used in the manufacture of ropes. Abaca, the so-called Manila hemp, which is obtained from the Philippine Islands, is the material most extensively used. Sisal is obtained from India, the East and West Indies, and from parts of Africa. Jute comes from India and from some parts of Russia. Manila hemp is preferred for all cordage where strength is required, because its fibers are

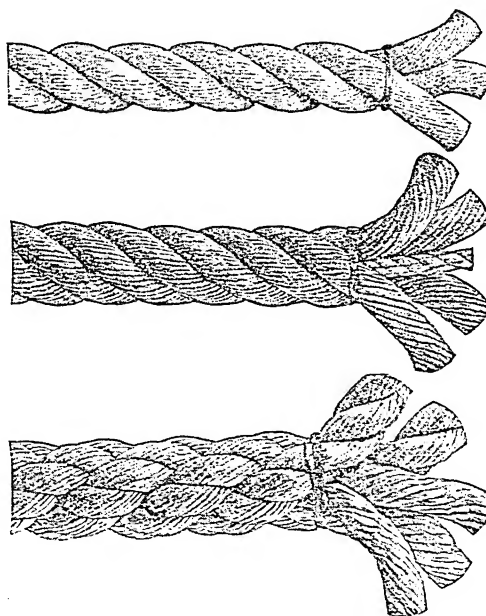


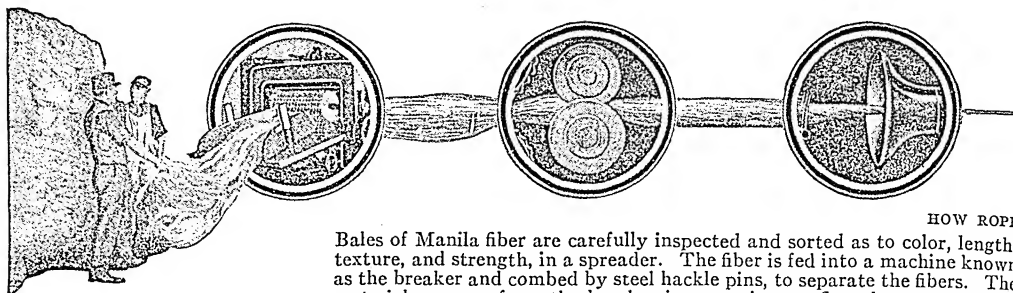
Photo: Columbia Rope Co.

THREE KINDS OF ROPE

From top to bottom, three-strand rope; four-strand, with center core; cable-laid rope. The latter is made for purposes that require springiness—rope that will stretch and then return readily to its original length. Such rope is used in oil-well drilling and for anchoring fishing ships.

longer and stronger than those of sisal or jute. Cotton makes the strongest rope, but its use is limited because of its expense. See **FIBER (Vegetable Fibers)**.

Manufacture. The processes in rope-making are practically the same for all materials, and with few exceptions, the work is all done by machinery. Hemp is received at the factory in



HOW ROPE

bales averaging about 270 pounds each. The fiber is taken from the bales, loosened, and sprinkled with oil. It is then passed in layers through a machine called a *spreader*. From the spreader, the hemp passes to the *breaker*, which straightens out the fibers and arranges them in a ribbon called the *sliver*. The sliver passes through several breakers, each finer than the other, until the fiber is prepared for spinning. As the fiber is spun into yarn, it is wound on large bobbins holding about 1,000 yards each. The yarn is twisted into strands, and each strand is twisted in a direction opposite to the one preceding.

The smaller ropes consist of three strands; this number is increased for larger ropes. Cables used in drilling wells vary in size from one and three-fourths to two and seven-eighths inches in diameter, and in length from 1,400 to 3,500

feet; these are made by twisting together three strands of Manila rope. Such cables are light, strong, and flexible.

Strength of Ropes. The strength of a rope depends upon its size and the material of which it is made. A hemp cord 1.53 inches in circumference will withstand a strain of 1,670 pounds. One 6.9 inches in circumference will lift a weight of 33,808 pounds. A cotton rope 6.51 inches in circumference will lift a weight of 23,258 pounds. Twenty-three-inch cables have been made; these are strong enough to lift a large locomotive.

Wire Ropes. Wire ropes are made of a number of steel wires twisted together. The twisting is done in the same manner as in laying the strands of a hempen rope. Wire ropes are extensively used for cables, for ship rigging, and in derricks for lifting heavy weights; and for many other purposes they have entirely displaced fiber ropes. See the article **WIRE**.

ROPSHIN, V. See **RUSSIAN LITERATURE** (Savinkov Boris).

ROQUE, roka. See **CROQUET**.

ROQUER, EMMA DE, the real name of Emma Calvé (which see).

RORQUAL, raw' kwahl, the popular name for a group of whales found in nearly all sea waters. They have a limited commercial value because the whalebone is of poor quality, and the percentage of oil in the blubber small. They may be recognized by their relatively small heads, long, slender bodies, and the deep muscular grooves in their throats, which permit them to take in large supplies of water in order to strain out their food. The adult blue whale, the largest animal known, reaches a length of eighty-seven feet and may weigh seventy-five tons. Even at birth they may be twenty-five feet long and weigh eight tons. See **WHALE**. J.G.H.

Scientific Name. Genus, *Balaenoptera*. The blue whale is *Balaenoptera sibbaldii*.

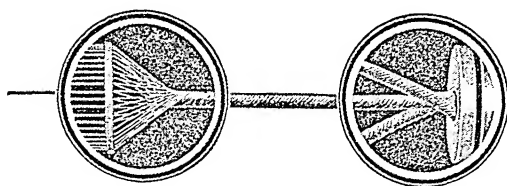
ROSA, MONTE, ro' zah, mohn' tay. See **MONTE ROSA**; **SWITZERLAND** (General Features); **ALPS** (Detailed Description).



Photo: Columbia Rope Co.

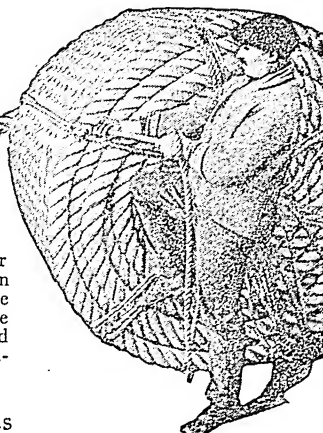
THE ABACA TREE

It is from this tree that Manila hemp is procured.



IS MADE

pact form, smaller in diameter than on the first machine. Still further compression follows in other machines. Then the fiber is again drawn through fine hackle pins and twisted into a yarn, which is wound on large bobbins. Next, the correct number of yarns for a certain size of rope are drawn through guides and twisted into strands. These strands, in required number, are then twisted together by automatic machines. The completed rope is then made into coils, or bundles, ready for shipment.



Photos: Columbia Rope Co

ROSA, SALVATOR (1615-1673), an Italian who displayed a many-sided genius of a high order. He painted marine views, landscapes, and battle scenes, and other works which portray action and wild life. Besides, he achieved some fame as an etcher and musical composer, and in the composition of satirical verse.

ROSACEAE. See ROSE.

ROSAMOND, *roz' à mund* (about 1140-about 1176), the mistress of Henry II of England, generally known as "fair Rosamond." Most of the stories told concerning her are mere legend. In later centuries there grew up romantic tales of a woodland bower built at the center of a labyrinth, through which her royal lover was guided by a clue; and fourteenth-century chroniclers declared that she died of poison administered by Eleanor, Henry's queen. She was buried in the nunnery church of Godstow, but in 1191, Hugh, bishop of Lincoln, had her body moved to the chapter house.

ROSARIO, *ro sah' re o*, a city in Argentina. See ARGENTINA (The Cities).

ROSARY, a string of beads, made of wood, metal, or stone, by which prayers are counted as an aid to memory. The rosary commonly used in the Roman Catholic Church consists of a circle of fifty small beads, divided into equal sections by four large beads. A pendant is attached which has two large beads, three small ones, and a crucifix. On the large beads are said the *Pater Nosters*; on the small ones, the *Ave Marias*; and on the crucifix, the *Apostles' Creed*. During the recitation of the rosary, the various mysteries of the faith are meditated upon, and at the conclusion of each group of *Ave Marias*, a doxology is said. The complete rosary consists of three recitations of the ordinary rosary, during which there is a reflection upon fifteen mysteries. Saint Dominic is credited with introducing this form of devotion into the Roman Church. Mohammedans and Buddhists also make use of beads in their prayers. See BEADS.

The Song. One of the songs of the present generation which has touched the hearts of the

people and has become a permanent addition to the world's music is *The Rosary*, composed by Ethelbert Nevin (which see). The words, by Robert Cameron Rogers, are given a remarkably harmonious musical setting. They are as follows:

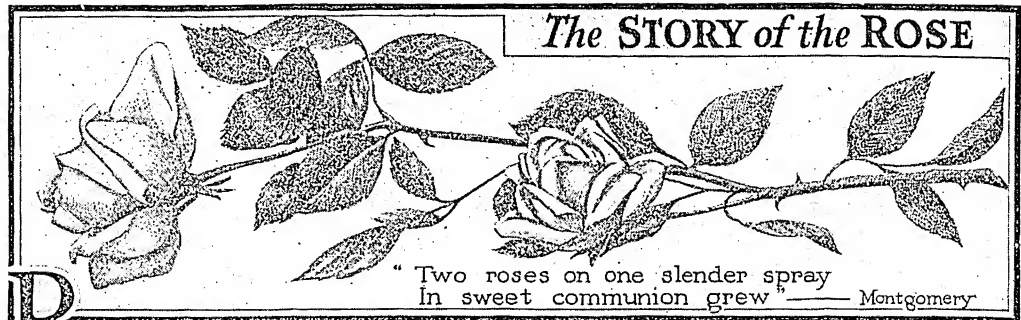
The hours I spent with thee, dear heart,
Are as a string of pearls to me;
I count them over ev'ry one apart,
My rosary, my rosary!
Each hour a pearl, each pearl a pray'r
To still a heart in absence wrung;
I tell each bead, unto the end,
And there a cross is hung!
O memories that bless and burn!
O barren gain and bitter loss!
I kiss each bead, and strive at last to learn
To kiss the cross, sweetheart! to kiss the cross.

ROSCIUS, *rosk' us*, QUINTUS (about 126-62 B.C.), a famous Roman comedian, born in a village near Rome. Natural ability combined with excellent training and diligent rehearsing made him a finished actor, and anyone who attained a high degree of perfection was called a "Roscius" after him. He adapted himself with ease to whatever character he portrayed, and much of his art was due to his ability to express himself through gesture. Some credit him with the first use of the actor's mask.

Roscius founded a school for actors, and Cicero, who later became a famous orator, was a pupil and an intimate friend. When Roscius became involved in a legal suit, Cicero defended him.

A.M.F.

ROSCOMMON, WENTWORTH DILLON, fourth Earl of (about 1630-1685), an English poet and critic, born in Ireland. He was a nephew of the Earl of Strafford. Roscommon is remembered especially for a translation, in blank verse, of the *Ars Poetica* (*Art of Poetry*), by Horace, and for an *Essay on Translated Verse*, in which he stated the principles of poetic diction. His poems were collected in 1701, after his death. He succeeded to the earldom in 1649. Roscommon was buried in Westminster Abbey.



ROSE, a name that has come to be a symbol of fragrance and loveliness, borne by a genus of flowers that grow wild in practically all temperate regions and on the mountain heights in the tropics. The oldest cultivated species comes from Persia and Northern India. No flower name brings to the mind more varied and more beautiful pictures than rose: pictures of the sweetbrier, the loveliest wild flower of the country roadsides; of its delicately reared cousin, the fragrant American Beauty, whose rich red petals are so soft and smooth they seem to be made of velvet; of white and yellow roses, and roses showing every shade of pink and crimson. References to the rose in literature and poetic tributes to this flower are numberless. The one which follows is typical, and is from the pen of Thomas Moore, who also wrote that favorite rose song, *The Last Rose of Summer*:

Rose! thou art the sweetest flower
That ever drank the amber shower;
Rose! thou art the fondest child
Of dimpled Spring, the wood-nymph wild.

Of the wild rose, it has been said that—

Our sweet, autumnal western-scented wind
Robs of its odors none so sweet a flower,
In all the blooming waste it left behind,
As that the sweetbrier yields it.

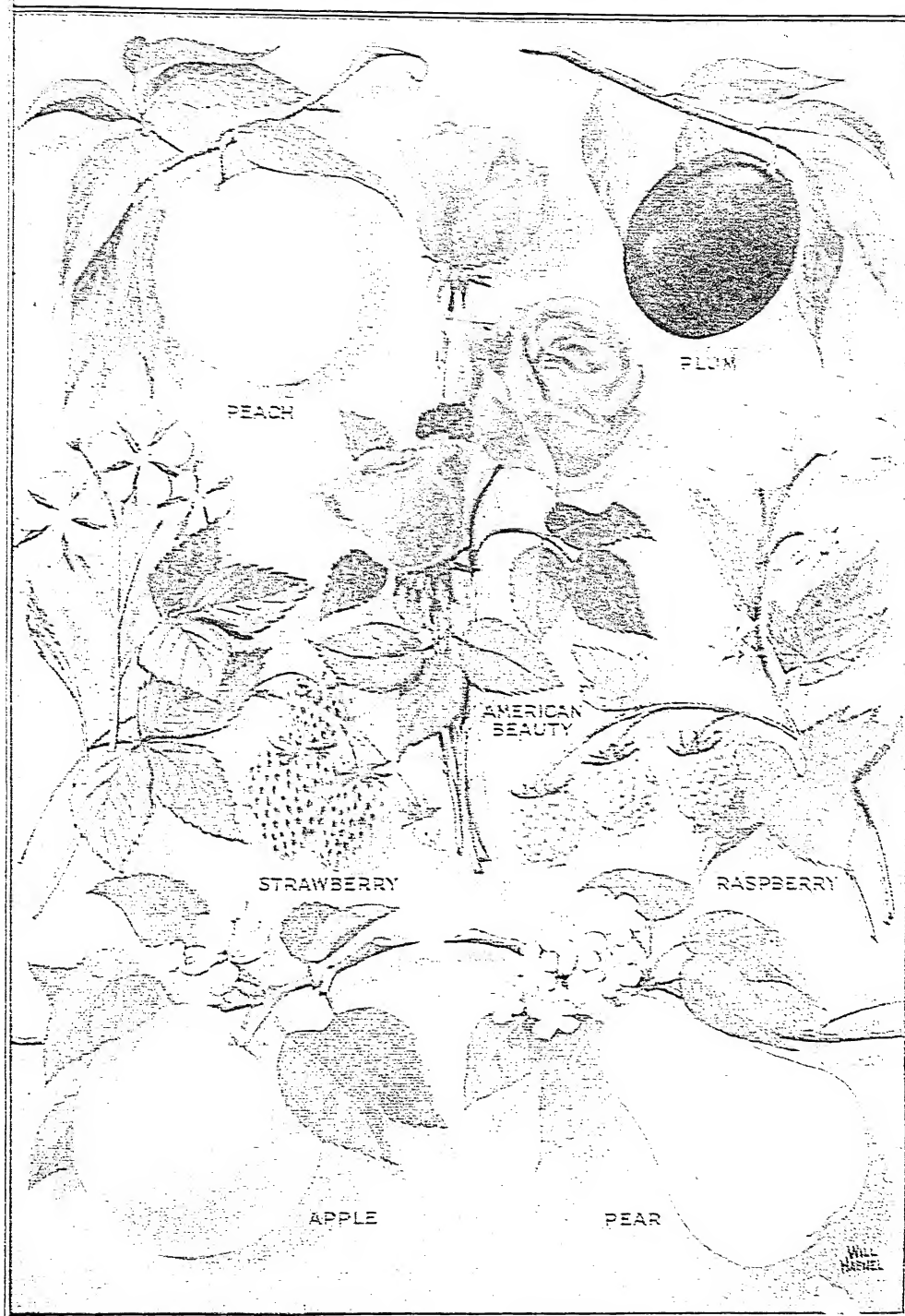
In English history, a red and a white rose were the respective emblems of the rival houses of Lancaster and York (see *ROSES, WARS OF THE*). How England came to adopt the red rose as its national emblem is told elsewhere in these volumes [see *FLOWERS (National Flowers)*]. Persia has for its national flower the Cherokee rose, a white Chinese rose that flourishes in the Southern United States; this is the state flower of Georgia. New York also has adopted the rose as its state flower [see *FLOWERS (State Flowers; Language of Flowers)*]. Roses flourish particularly well in mild climates like those of Southern France and the Pacific-coast regions of the United States. In Portland, Ore., which is preëminently a "Rose City," a day in June is set aside each year for the celebration of the carnival of roses, and this custom is followed in other cities of the West.

Kinds of Roses. The rose genus has given its name to one of the most important families of the plant kingdom (see *Rose Family*, below). Of this family it may be considered the type. Roses grow in such a variety of soil and climate, and adapt themselves so readily to cultivation, that different varieties have been developed by the hundreds. Botanists disagree widely in their classifications, the estimates for number of species of roses ranging from thirty to 250. In its natural state, the rose plant is an erect or climbing shrub, which bears thorns and single flowers having five petals. The flowers borne by cultivated varieties are generally double, and some forms have been produced that are thornless. Floriculturists recognize two main classes of cultivated roses—those that bloom once a year, usually in early summer; and those that flower more than once in a single season. The latter are known as *perpetual*, or *summer and autumn*, roses.

The early-summer roses are represented by such forms as the Yellow Briers, Damask, Moss, and Climbers; the perpetual, by the Hybrid Teas, Hybrid Perpetuals, Teas, Polyanthas, Baby Ramblers, China, and Rugosas. The descriptions of these groups, and of the scores of varieties belonging to them, would fill a small volume. The best varieties of the Hybrid Perpetual roses, which are prized for their hardiness and reliability, include General Jacqueminot, Clio, Paul Neyron, and Ulrich Brunner. The Hybrid Teas, though not so hardy as the foregoing, bloom more continuously. Among those that do well in the open are Radianc, Escarlata, Lady Alice Stanley, and Kaiserin. The Teas are even less hardy, and in regions north of Virginia, they need careful protection over winter. So numerous are the varieties that the prospective rose-gardener should purchase a standard catalog, one which lists all the different sorts of roses and gives information as to their suitability for home culture.

How to Grow Roses. Most roses are grown from slips and cuttings, but new varieties usually originate as seedlings. The best cultivated sorts seldom bear seeds, and if seeds are borne, there are few good ones. The

SOME MEMBERS *of the* ROSE FAMILY



reasons are, first, that cultivated roses are hybrids, which commonly are infertile; and, second, that in the double roses, the seed-producing organs have been converted into extra petals.

In selecting a plot for a rose garden, one should choose a site protected from cold winds and open to the sun for several hours of the day. A deep, rich loam is usually the best soil for these flowers, but Hybrid Tea roses can be grown in sandy and gravelly soil. Whatever the soil, it must be well drained. If artificial drainage is necessary, this may be secured by placing a layer of small stones or gravel about two feet below the top soil and sloping it so as to carry off

to have the plants so arranged that the beds can be easily watered and weeded. A good general rule is to have the beds not over five feet wide, and the rose plants from eighteen inches to two feet apart each way, according to their spreading habits. An essential point in successful rose-growing is to keep the surface

soil loose during the growing season, well into July in case of spring planting. This may be done with a hoe and a sharp steel rake.

The Rose Family. Botanists combine all members of this family of plants under the name *Rosaceae*. In the family are about 2,000 species of trees, shrubs, and herbs, and it is represented by some of our most valuable fruits and loveliest flowers.

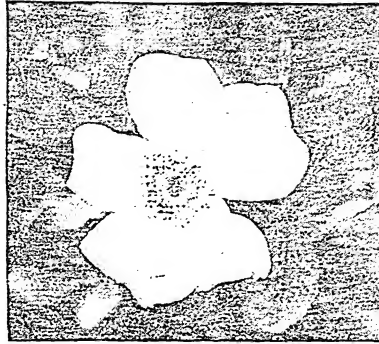


Photo: St. Clair, Visual Education Service

THREE OF THE ROSES

At top, wild rose; left, roses of the Pacific states; right, sweetbrier roses.

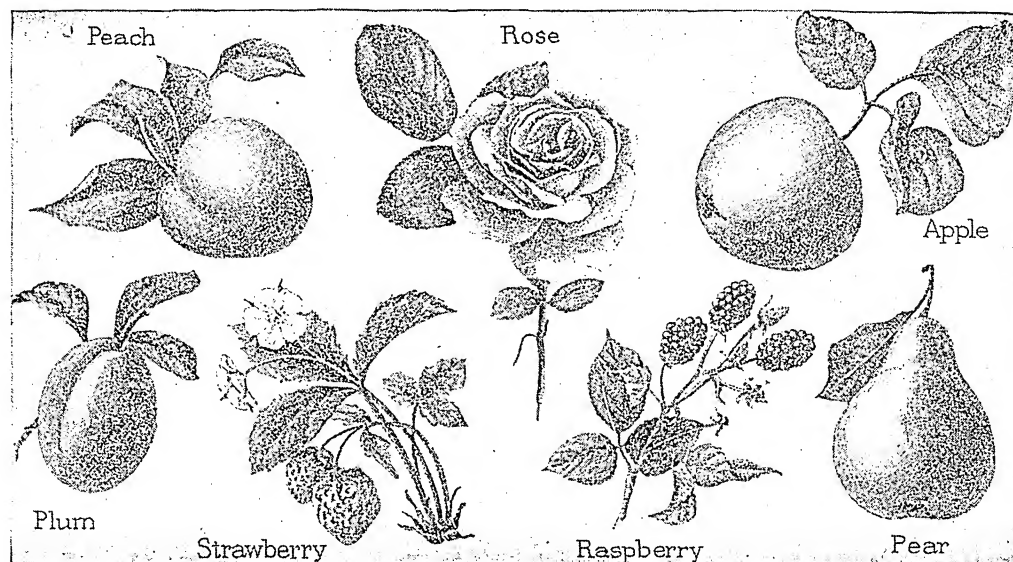
the surplus water. Roses, like children, cannot be healthy if their feet are wet. A few weeks before planting, one should mix the soil, to a depth of two feet, with about one-third its bulk of rotted manure. Rose roots must not be allowed to come in contact with fresh manure, for, in the language of the gardener, it will give them indigestion.

The time for planting depends on variety of rose and on location. Though some hardy roses can be planted in autumn, the general rule is to plant in the spring. When the stems are received from the greenhouse, see that the roots are protected from the drying action of the winds until they are put in the ground. If necessary, cover them with burlap or similar material, and keep them damp. The holes should be deep enough to permit the roots to point downward and to slant outward, for they must not lie flat. Care should be taken

To the rose family belong a large proportion of the commercial fruits of the temperate regions, notably the apple, pear, and quince, the berries, and the peach, apricot, plum, and cherry. Its numerous ornamental plants include the rose, the meadowsweet, the mountain ash, and the hawthorn. Many useful products are yielded by rosaceous plants, such as oil of bitter almonds, attar of roses, and several fine cabinet-woods. The plants of this family bear regular flowers, each having five petals, a five-lobed calyx, numerous stamens, and one or more carpels [see FLOWERS (Flower Structure)]. As they are seed-bearing plants, they are classed as *angiosperms*, and because they produce two seed leaves, they belong to the *dicotyledonous plants*. See *CORYLEDON*, and illustration on page 1710.

B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:



SOME MEMBERS OF THE ROSE FAMILY

Angiosperms
Attar

Botany
Flowers

Hawthorn
Mountain Ash

ROSE, URIAH M. (1834-1913), a lawyer of international reputation and a charter member of the American Bar Association, of which he was president in 1901. He represents the state of Arkansas in Statuary Hall, Washington, D. C., the statue having been presented in 1917. In 1907 he was appointed by President Roosevelt as one of the delegates to the International Peace Conference at The Hague, and was given the rank of ambassador on that mission. See PEACE CONFERENCE, INTERNATIONAL; STATUARY HALL.

ROSE BAY. See RHODODENDRON.

ROSEBURY, ARCHIBALD PHILIP PRIMROSE, Earl of (1847-1929), a distinguished English statesman who succeeded to the title in 1868, on the death of his grandfather, and in the same year took his seat in the House of Lords. There he speedily acquired a reputation as a forceful speaker, and by advocating measures for bettering the condition of the working classes, won a popularity usually falling only to members of the House of Commons. His first office was the Under-Secretaryship for Home Affairs, which he received in 1881 and held for two years, resigning because there was considerable opposition to a member of the House of Lords holding that post. In 1884 he became First Commissioner of Works, with a seat in the Cabinet, and although he went out of office with the Liberals in the next year, he became Secretary of State for Foreign Affairs in the brief Ministry of William E. Gladstone, in 1886. Meanwhile, he had been chosen lord rector of Aberdeen University in 1878, and of Edinburgh University in 1880.

In 1889 Lord Rosebery became chairman of the first London County Council, and in 1892 was given by Gladstone the post of Foreign Secretary in the new Liberal Cabinet. When Gladstone resigned, in 1894, Rosebery became Prime Minister; the appointment gave general satisfaction, although the Ministry endured for only fifteen months. Lord Rosebery remained leader of the Liberals, however, until October, 1896, when he broke with the party on the question of intervention in Turkey, strongly recommended by Gladstone, to check Armenian atrocities (see ARMENIA).

From that time, he took no active part in party politics, though retaining all his old interest in public affairs, and making many public speeches on political questions. His influence was felt, nevertheless, and his opinion was respected by his followers. He bitterly criticized the Parliament bill of 1911, and proposed reforms within the House of Lords, introducing more democratic elements. But it was the plan of the Liberals to deprive the House of Lords of its power first, and reform it later. To show his contempt for the impotence of the reformed House of Lords, Lord Rosebery refused to attend the debates, but at the outbreak of World War I, he was unable to resist the call of patriotism. He served by encouraging recruiting and other war activities, and helped to prevent a premature peace through his influence and public speeches. He lost his younger son, the Hon. Neil Primrose (1882-1917), in the World War.

In 1911, when King George V was crowned, Lord Rosebery was made Earl of Midlothian (an English earldom, while Rosebery was a Scottish earldom). At the coronation of both

King Edward and King George, Lord Rosebery was one of the peers who bore the canopy at the ceremony.

In Literature. Lord Rosebery is the author of various publications, including *William Pitt; Appreciations and Addresses; Sir Robert Peel; Napoleon; Cromwell; Chatham; His Early Life and Connections; and Miscellaneous Literary and Historical*. The last is a collection of papers published in 1901.

ROSE BUG. See ROSE-CHAFER.

ROSE-CHAFER, often called the ROSE BUG, is a beetle about one-third inch long, of a light brownish color, with very long, spiny legs. It is a general feeder, found frequently on roses, numerous ornamentals, grapes, and various fruit trees. The beetles eat the blossoms of grapes and roses, and often the fruit of apple. Many fruits are subject to attack. The insect is particularly destructive in localities where there are large areas of grassland. Trees and vines in or near large pastures are subject to annual attack. The insect occurs throughout the Eastern and Central states.

After feeding three or four weeks, the beetles disappear. The females deposit their eggs in the soil; these eggs hatch, and the larvae feed upon the roots of grass. They become nearly grown by fall, when they go below the frost line for the winter. The larva, which resembles a white grub, comes near the surface in the spring and pupates. There is only one generation a year.

When the beetles are very numerous, the best means of preventing injury is to cover small plants with cloth, or to pick the beetles off by hand. Large numbers can be collected in a pan containing water and kerosene. Commercial plantings of grapes, apples, and other fruit may be protected by heavy applications of arsenate of lead, five pounds of powder being used to fifty gallons of water. The addition of one-half gallon of molasses makes the foliage more attractive, but it is also likely to increase slight arsenical injury to the foliage.

W.J.S.

Classification. The scientific name of the rose-chaffer is *Macrodactylus subspinosus*; it belongs to the order Coleoptera.

ROSE COLD. See ASTHMA.

ROSECRANS, ro' se' krans, WILLIAM STARKE (1819-1898), a brigadier general in the Union army during the War of Secession. He was born at Kingston, O., was graduated at West Point in 1842, and served in the army as civil engineer until 1854. At the beginning of the War of Secession, he was appointed as aide to General McClellan, and when the latter was made commander of the Army of the Potomac, Rosecrans was commissioned brigadier general and placed in command in West Virginia. In 1862, after the evacuation of Corinth by the Confederates, he was given

command of the army in Mississippi, and successfully defended the city against Price and Van Dorn; but in 1863, as commander of the Army of the Cumberland, he was defeated by Bragg at Chickamauga. Shortly afterward, Rosecrans was succeeded by Thomas as chief of the Army of the Cumberland, and eventually was relieved of all authority.

At the close of the war, he resigned from the army, and in 1868 was appointed minister to Mexico. From 1881 to 1885 he was a member of Congress from California, and from 1885 to 1893 was register of the United States Treasury. His rank of brigadier general was restored to him by Congress in 1889. See WAR OF SECESSION.

ROSEMARY, an evergreen shrub of the mint family, loved for the aromatic fragrance of its leaves. It is a native of the Mediterranean region. Rosemary grows from four to eight feet high, and bears dark-green leaves with a white under surface, and tiny pale-blue flowers. When seen in masses, it looks like blue-gray mist blown over the meadows from the sea. The name, in fact, is derived from the Latin *rosmarinus*, meaning *sea dew*. Rosemary yields an oil which is used chiefly in perfumes and in aromatic waters. The plant is an emblem of fidelity and remembrance. In *Hamlet* occurs the often-quoted remark of Ophelia, "There's rosemary, that's for remembrance."

B.M.D.

Scientific Names. Rosemary belongs to the family *Menthaceae* (or *Labiatae*). Its botanical name is *Rosmarinus officinalis*. It is the only species known.

ROSENWALD, JULIUS (1862-1932), an American merchant and philanthropist. His chief interest was in negro education (see below) and in Jewish benefactions, but he also devoted much of his time and wealth to civic and educational organizations.

He was born and educated in Springfield, Ill., but as early as 1879 left the Middle West for New York City. Within six years he returned to Chicago as president of a firm of clothing manufacturers. In 1895 began his long connection with Sears, Roebuck and Company. For fifteen years he was its vice-president and treasurer, and for fifteen more was president. From 1925 until the time of his death he was chairman of the board of that great mail-order establishment.



Photo: Brown Bros.

GENERAL ROSECRANS

His death occurred January 6, 1932, at his home in Ravinia, Ill., a suburb of Chicago.

During World War I, Rosenwald served on the Advisory Commission of the Council of National Defense and as a member of the Second Industrial Conference. He gave large sums to war-relief organizations, and in 1920-1921 assisted the Hoover Children's Relief Fund. Other benefactions include a gift of \$5,000,000 to the Russian Jews of Southern Russia, to help them colonize that section; \$3,000,000 toward the establishment of an industrial museum in Chicago; and large sums to the University of Chicago.

His housing project in Chicago combines business with philanthropy. Rented only to negroes and erected on an expensive site, the apartments make a moderate profit.

The Julius Rosenwald Fund. Since 1917, Mr. Julius Rosenwald and the Fund which he created have been making contributions to the building of rural negro schools. An office is maintained in Nashville, Tenn., to supervise this activity. More than five thousand schools have been built. Since its reorganization in 1928, the Fund has enlarged its program to include the encouragement of pay clinics and other forms of organized medical services for the man of moderate means, and projects in general education and child study and in the social sciences and public administration.

In 1928 the organization of the Rosenwald Fund was completed, with a self-perpetuating board of nine trustees and a capital of \$30,000,000. The resources were contributed by Rosenwald with the unusual stipulation that the capital and income must be spent within twenty-five years after his death. In a letter addressed to the trustees, he stated, "I am not in sympathy with this policy of perpetuating endowments, and believe that more good can be accomplished by expending funds as trustees find opportunity for constructive work, than by storing up large sums of money for long periods of time." Under the new organization, the scope of the activities of the Fund is left to the discretion of the trustees.

Museum of Science and Industry. On the site of the Fine Arts Building in Jackson Park, Chicago, which was one of the most attractive features of the World's Columbian Exposition in 1893, construction was begun in 1929 of a replica of the great building in stone, to cost \$5,000,000. The new building houses the collections of the Museum of Science and Industry, founded by Julius Rosenwald, who inaugurated the museum movement with a donation of \$3,000,000 for its equipment. The plan, upon its conception, was laid before the Commercial Club of Chicago, which appointed a board of trustees and undertook the task of creating the museum and administering the Rosenwald donation.

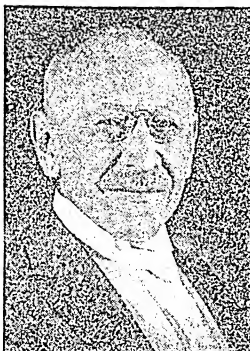


Photo: U & U

JULIUS ROSENWALD

The old Fine Arts Building, an architectural masterpiece which was described by Augustus Saint Gaudens as "the finest thing done since the Parthenon," was in process of disintegration, having been built only for the temporary purposes of the World's Fair. Its location was unsurpassed, and the structure itself furnished a noble model for a museum building. The park authorities therefore appropriated the beautiful site for the proposed Museum, and were duly authorized to issue bonds to the value of \$5,000,000 for reconstruction of the building. In 1933, 239 exhibits were opened to the public. By 1937 the West Pavilion was opened, and by 1938 the interiors of the Central and East Pavilions were completed. See illustration, page 7848.

The Museum of Science and Industry is patterned largely after the famous Deutsches Museum of Munich, which is more than a rich storehouse for the marvelous products of science and engineering. The industrial machines and processes of manufacture exhibited are shown in motion; the hidden mysteries of great engines are revealed; paintings, charts, and models supply the salient facts of processes and production; and daylight motion-picture projectors supplement the exhibits. In brief, in this German museum modern industrial apparatus is interpreted and made clear to the public. A like aim will be achieved in Chicago.

ROSE OF CHINA. See HIBISCUS.

ROSE OF JERICHO. See JERICHO ROSE.

ROSE OF SHARON. See HIBISCUS.

ROSES, WARS OF THE, in English history, the struggle in the latter part of the fifteenth century between the House of York and the House of Lancaster for the possession of the English throne. The House of Lancaster took as its emblem a red rose, the House of York a white rose, and from these insignia came the name given to the conflict. The wars began in 1455 with the Battle of Saint Albans, and closed with the Battle of Bosworth, in 1485.

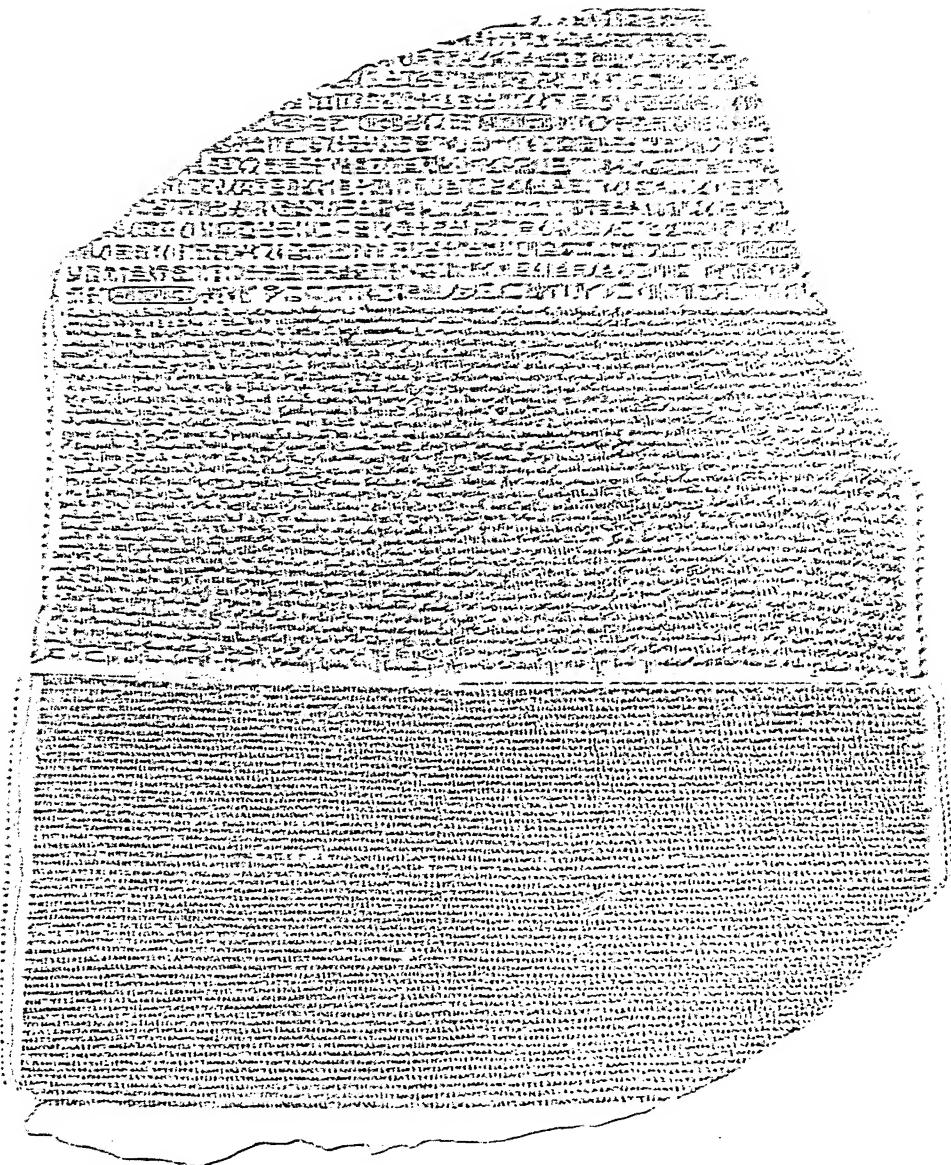
At the outbreak, the king was Henry VI, a grandson of the Lancastrian Henry IV, who had seized the throne in 1399; his chief opponent was Richard, Duke of York. During the struggle, Henry was deposed and Edward IV of the House of York was crowned king; Henry was reinstated and a second time forced to give up the royal authority to Edward. The Yorkists held the royal power without active opposition until the accession of the unpopular Richard III, whom a rising under the Duke of Richmond, head of the Lancastrian House, drove from the throne. Richmond was crowned king as Henry VII, and by marrying Elizabeth, daughter of Edward IV, he united the two rival houses.

The war lasted thirty years, but only fourteen battles were fought. The old nobility was destroyed and the check on the power of the king removed. Henry VII became almost an absolute monarch.

Related Subjects. The reader is referred in these volumes to the following articles:

England (History)
Lancaster, House of

Warwick, Richard N.
York, House of



ROSETTA, *ro zel' ah*, **STONE**, the stone which gave to the world the key to the translation of the long-lost ancient Egyptian language and made possible the extensive modern study of the history of the Nile Valley and its people, through ancient literature. The stone is inscribed with a decree of the Egyptian priesthood, which had assembled at Memphis in 195 B.C. This decree, issued in honor of Ptolemy V Epiphanes (205-181 B.C.), was written in hieroglyphics, or picture writing, in demotic, a simplified form of Egyptian writing, and in Greek. Scholars were able to decipher the Egyptian texts by comparing them with the Greek, and in this way they found the clue to the hidden characters of the language of the ancients. Chief honor for the discovery of the clue is due François Champollion, a French Egyptologist.

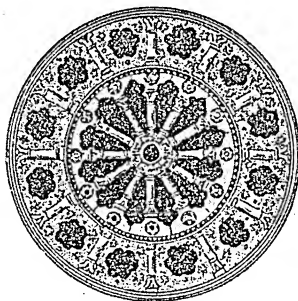
The Rosetta Stone, now in the British Museum, is composed of black basalt. It was found near Rosetta, Egypt, in 1799, by a French officer of Napoleon's engineering corps. Parts have been broken away, and at present it is three feet nine inches in height, eleven inches in thickness, and two feet four and one-half inches in breadth. See page 6207.

Related Subjects. The reader is referred in these volumes to the following articles:

Archaeology (Development)	Egypt
British Museum	Hieroglyphics

ROSE WINDOW, a large, circular window divided by tracery or bars into compartments, used in Gothic churches. Usually, a rose window is formed of beautifully colored glass, but it is frequently of plain glass; the name is not due to color, but to its shape. Where the stone tracery radiates in the form of spokes, the rose window is often called a *wheel window*. Where the voids form the design, it is called *plate tracery*. The decorative rose window was a feature in the church architecture of the thirteenth and fourteenth centuries in France and England, and is also seen today in churches of pretentious architecture. Among the beautiful examples of this type of window are those in Notre Dame Cathedral, Paris, in the cathedral at Amiens, and in the restored Reims Cathedral.

ROSE WINDOW
Italian in design



ROSEWOOD, the name of several varieties of a beautiful wood used in making ornamental furniture and musical instruments. It is also employed as a veneer. Rosewood is prized

for the high polish it attains, and for its rich color, which varies from red-brown to purple, or almost black. The black varieties are often beautifully streaked with red. When the wood is cut or sawed, a slight odor of roses is perceptible, which accounts for the name. The heartwood grows to great dimensions, and is always faulty, as decay begins before the tree matures. For this reason, squared planks or logs are not seen; the wood is imported in slabs from ten to twenty feet long, and from five to twelve inches wide in the heaviest part. On account of its irregular form, the wood is sold by weight, the price depending upon the richness of the color. It comes principally from Jamaica, Brazil, Honduras, East India, and Africa; a choice quality is the product of the blackwood tree (*Dalbergia latifolia*), found in Malabar, India.

G.M.S.

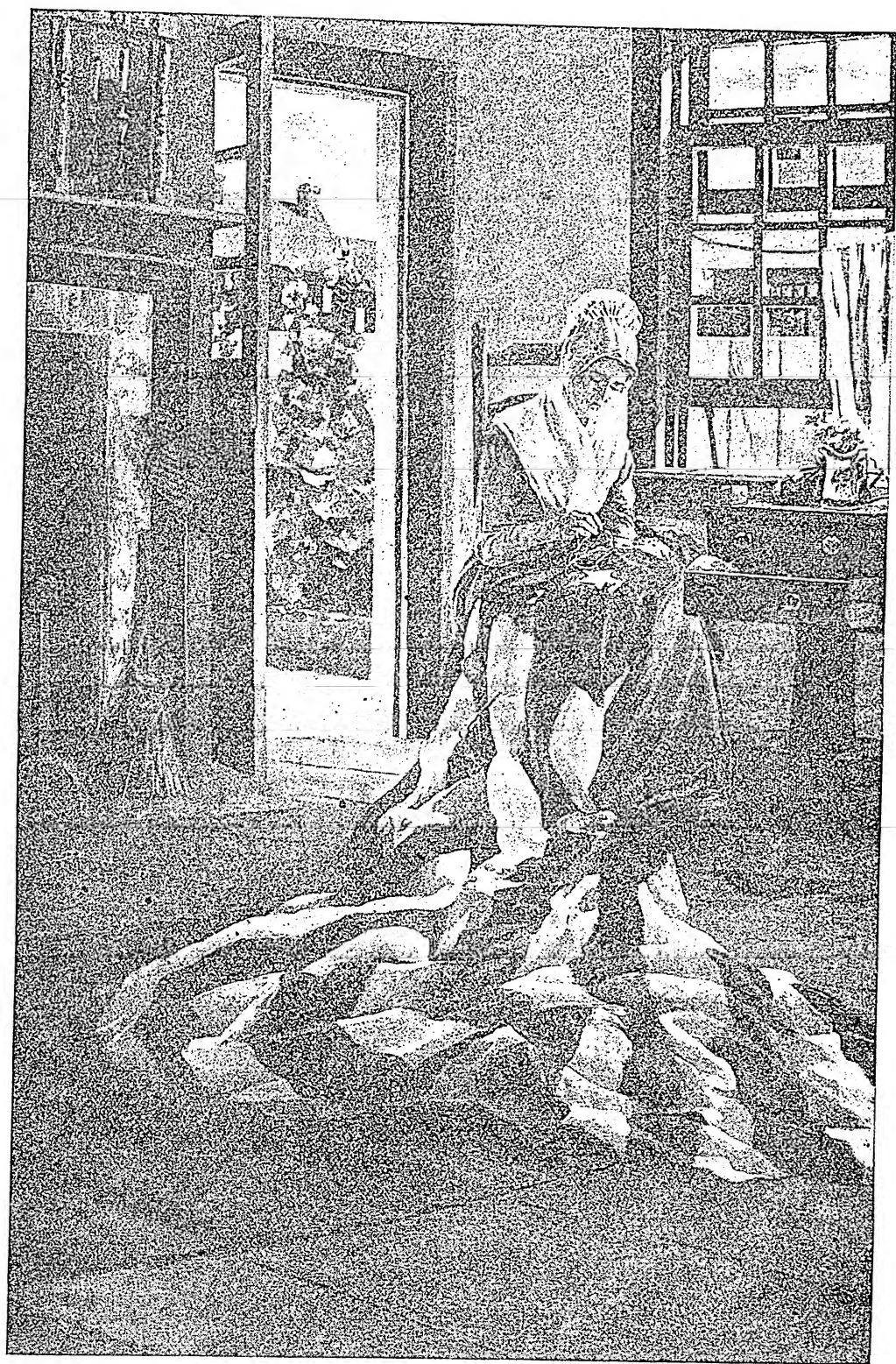
ROSICRUCIANS, *ro ze kroo' shanz*, members of the Ancient and Mystical Order Rosae Crucis (AMORC), a fraternity of mystics founded in early Christian centuries and periodically operative in every country. The members are seekers for knowledge of benefit in the rational development of latent powers and abilities of practical use in the mastership of life's earthly problems. American Headquarters, San Jose, Calif.

C.D.D.

ROSIN, *rah' zin*, the resin of commerce, is obtained chiefly by distilling crude turpentine, which is the sap of certain species of pine. Rosin is a brownish-yellow solid, resembling a gum in structure and having an odor like that of varnish. It is most extensively employed in the manufacture of varnish, and is also used for hardening laundry soap, in soldering, in the manufacture of sealing wax, and in making some kinds of plaster and cement. Rosin keeps smooth surfaces from being slippery, and is therefore rubbed on the bows of musical instruments. See RESINS; TURPENTINE; illustration on page 6210.

G.M.S.

ROSS, BETSY (1752-1836), an obscure seamstress of Philadelphia who has been credited by her grandson, William J. Canby, as the maker of the first American (stars and stripes) flag. As the story goes, in June, 1776, while she was living on Arch street, this expert needlewoman was visited by a committee from Congress, headed by General Washington; they desired her to make a flag. Washington preferred six-pointed stars, but she persuaded him to allow her to make five-pointed ones. This design was adopted by Congress on June 14, 1777 (see FLAG [United States Flag]). It was not until 1857 that Canby wrote out his notes of the story (first published in 1870) told him as a lad of eleven in 1836 by his eighty-four year-old grandmother. While Betsy Ross is known to have made various other flags, this particular story is generally regarded by historians as a legend. However, the Betsy Ross Memorial



Betsy Ross in Her Arch Street Home. Her name is connected in legend with the making of the American flag.
This picture is an artist's conception.

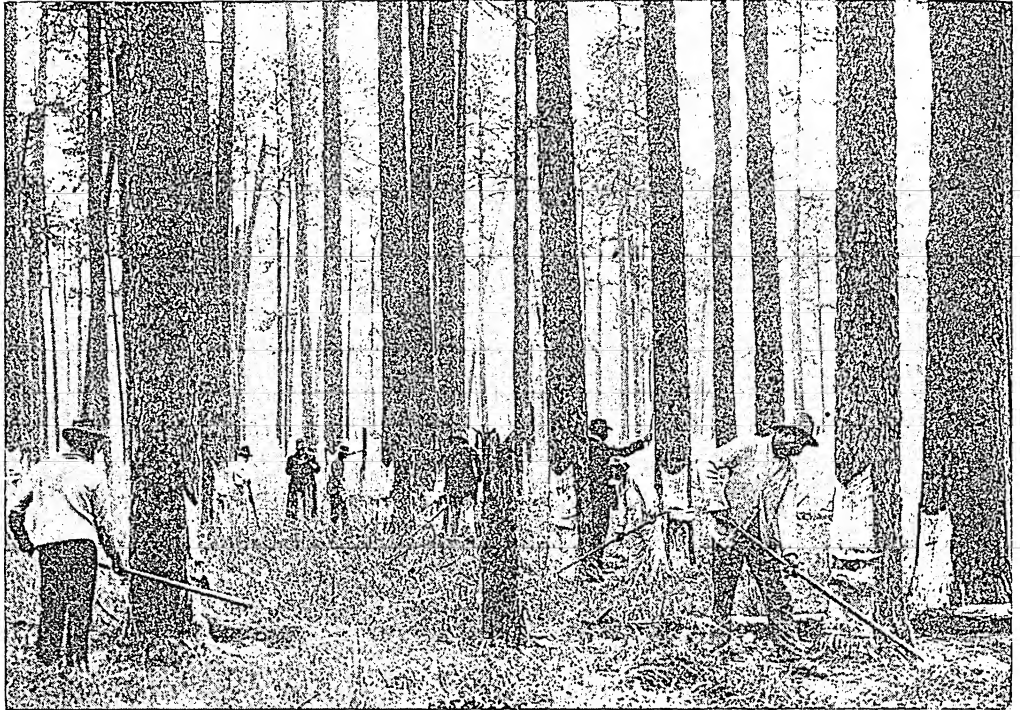


Photo: U & U

EXTRACTING ROSIN FROM A PINE FOREST (SEE PAGE 6208)

Association (private), made a permanent memorial of an Arch Street house supposedly hers.

Betsy Ross was the daughter of Samuel Griscom, a Quaker shipbuilder and carpenter who helped build Independence Hall. Her husband, John Ross, was the nephew of one of the signers of the Declaration of Independence. See PHILADELPHIA (Historic Buildings).

ROSS, SIR JAMES CLARK (1800-1862), an English explorer, born in London. He entered the navy when twelve years old, and in 1818, and again in 1829-1833, he accompanied his uncle, Sir John Ross, on expeditions in search of the Northwest Passage. On the second of these excursions (1831), he distinguished himself by discovering the location of the north magnetic pole. In the interval between these two voyages, he made four Arctic expeditions under Sir William Parry (which see). His most noteworthy service to science, however, was his expedition in 1839 with the *Erebus* and *Terror*, which sailed to the Antarctic seas. He discovered a great body of land, which he named Victoria Land, several islands, and an active volcano which he called Erebus. The latitude reached by him, 78° 10' S., established a record not broken until 1900. On his return, Ross was knighted, made a member of the French Legion of Honor, and in 1848 he was elected to the Royal Society. In the same

year, he headed an unsuccessful expedition in the *Enterprise* to Baffin Bay, in search of Sir John Franklin (which see), and in 1856 became a rear admiral.

An account of Ross's Antarctic journey is contained in *A Voyage of Discovery and Research to Southern and Antarctic Regions*, which he published in 1847.

Related Subjects. For comparison of his voyages in Antarctic regions with others which followed, see AMUNDSEN, ROALD; BYRD, RICHARD E.; SCOTT, ROBERT F.; SHACKLETON, SIR ERNEST. See, also, ANTARCTIC LANDS AND SEAS; POLAR EXPLORATION; AIRCRAFT.

ROSS, JOHN. See NORTHWEST PASSAGE.

ROSS, NELLIE TAYLOR (1880-), the first woman governor in the United States. She was born at Saint Joseph, Mo., and was educated in public and private schools. In 1902 she married William B. Ross, of Cheyenne, Wyo., who was elected to the office of governor in 1923. On January 5, 1925, at Cheyenne, Mrs. Ross took the governor's oath of office, in order to fill the unexpired term of her husband, who died in October, 1924. A close confidante of her husband, she knew his administrative plans and understood the policies that he had developed. Democratic politicians, convinced that no member of the party was more capable of filling the vacancy than Mrs. Ross, had persuaded her to accept the nomination. She did not have to fear that her nomina-

tion would be unfavorably received, for at the state convention, she was chosen unanimously. After serving for several years as vice chairman (women's activities) of the National Democratic Committee, she resigned in 1934. Since 1933, she has been Director of the United States Mint, being the first woman to hold that position.

ROSS, ROBERT. See WAR OF 1812.

ROSS, SIR RONALD, British scientist. See MALARIA.

ROSS BARRIER. See ANTARCTIC LANDS AND SEAS.

ROSS DEPENDENCY, a group of uninhabited islands near the South Pole, lying southeast of New Zealand. The Dependency belongs to Great Britain, and in 1923 was attached to New Zealand for administrative purposes. The international date line (which see) passes through it. The Dependency is of value only as a breeding ground for marine animals; these are of economic importance. The coasts of the Ross Sea are also part of the Dependency. For map, see ANTARCTIC LANDS AND SEAS (map).

ROSSETTI, *ro set' e*, CHRISTINA GEORGINA (1830-1894), an English poet, sister of Dante Gabriel Rossetti (which see). She was born in London, educated in her home with her brothers and sisters, and lived a quiet, retiring life. Her interests were two—religion and poetry; and, naturally, all her writings show clearly her religious, mystic tendency. They are, however, almost as noteworthy for the delight which they reveal in the simple physical beauty of the world. Critics agree in ranking Christina Rossetti next to Mrs. Browning among English women writers of the nineteenth century, and some of her short lyrics stand among the best things ever produced in English.

Her Writings. *Goblin Market and Other Poems*, *The Prince's Progress and Other Poems*, and *A Pageant and Other Poems* contain the most of her work. *Up Hill* is probably the best-known of her poems. Seven of her lyrics have been set to music, and cantatas were composed for two of her longer poems.

ROSSETTI, DANTE GABRIEL (1828-1882), an English poet and painter, one of the prominent leaders in a movement to bring back to painting the purity and simplicity which had characterized it in the Middle Ages. He and his companions in this movement organized the Pre-Raphaelite Brotherhood in 1848, and founded a periodical called *The Germ* for the

exposition of their views (see PRE-RAPHAELITES). In this paper was published one of Rossetti's earliest and loveliest poems, *The Blessed Damozel*, the opening lines of which suggest the idealism and spirituality of all the Pre-Raphaelite art and literature:

The blessed damozel leaned out
From the gold bar of Heaven;
Her eyes were deeper than the depth
Of waters stilled at even;
She had three lilies in her hand,
And the stars in her hair were seven.

Rossetti was the eldest son of an Italian painter and writer who was exiled for taking part in the revolution of 1820. Dante Gabriel was born in London, where his father settled in 1824. The boy grew up under literary and artistic influences, and was well educated, studying at King's College School and at the Royal Academy of Art. Here he came in contact with Sir John Millais and Holman Hunt. The influence of Ford Madox Brown, who became his art teacher when Rossetti was twenty, was also far-reaching. Rossetti was married in 1860 to a beautiful girl who furnished the inspiration for the best of his paintings and of his poetry, and when she died, two years after their marriage, his grief was so intense that he placed in her coffin all of his writings then unpublished. In 1870, yielding to the demands of his friends, he permitted these to be exhumed and published.

Rossetti's paintings are remarkable chiefly for their spiritual quality and mysticism. He found his themes in Biblical subjects, in the life and work of Dante, and in his own imagination. Just as his paintings express the idealism that characterizes his poetry; so his poems have a beauty of language that is best described as word painting. In both forms of his art, he expressed unreservedly his individuality.

His Works. The writings taken from his wife's coffin; a volume entitled *Ballads and Sonnets*; and a series of translations of early Italian poets constitute his entire poetical output. Of his sonnets, the most notable are found in a group of beautiful love poems entitled *The House of Life*. He also wrote *Hand and Soul*, a delicately imaginative story in prose.

Girlhood of Mary Virgin; *Dante's Dream* and *Beata Beatrix*; and *The Blessed Damozel* and *Fiammetta* represent the different subjects of his paintings.

ROSSIGNOL, LAKE. See NOVA SCOTIA.

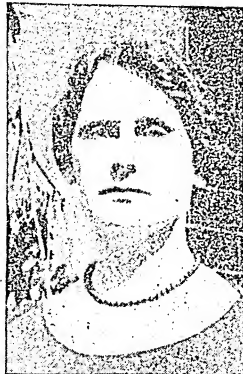


Photo: U & U

NELLIE TAYLOE ROSS

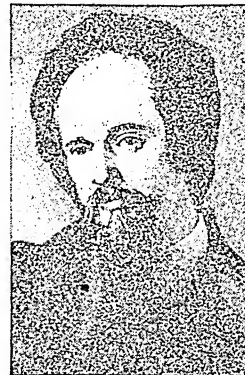


Photo: Brown Bros.

DANTE GABRIEL ROSSETTI

ROSSINI, *roh se' ne*, GIOACHINO ANTONIO (1792-1868), one of the leading composers of the school of Italian lyrical opera. He was born at Pesaro. His mother was the daughter of the town baker and his father was the town trumpeter, who played with strolling musicians in summer, and thus made enough money to keep the family during the winter. At the age of ten, Rossini played a horn with these rough wanderers, and the lawless life he led showed its effect later in his personal conduct, as well as in his operas. His first musical instruction he received from Prinetti of Novara, who played the scale with two fingers only, and sold liquor to supplement his income. When Rossini was fifteen years old, he went to Bologna to study music, and two years later could sing at sight any composition placed before him. He was compelled by his teachers to study counterpoint, a subject which he detested, and as soon as he had learned enough of it to compose operas, he refused further musical training and ceased his work as a student. In after years, his operas revealed his ignorance of many points in composition, but as he was a man of much vanity, he never seemed to realize his weaknesses.

When Rossini was eighteen years old, he wrote his first opera, *La Cambiale di Matrimonio*, but it was in his twentieth year that he began to show marvelous inventive powers. Between 1810 and 1813, he composed five operas, one of which, *Tancredi*, a story of the Crusades, was a remarkable success, and created wild excitement when produced at Venice (1813). In 1816 and 1817, Rossini had a contract to write two operas each year for a theater at Milan, and in that period produced such highly popular compositions as *The Barber of Seville* and *Otello*. During the next five years, he wrote with great rapidity such operas as *Moses in Egypt*, *Ermione*, and *The Lady of the Lake*, the latter based on Scott's famous poem. These successful works all appeared before Rossini's thirtieth birthday. In 1821 he married a very wealthy woman, and soon went to Vienna to direct the production of the operas *La Cenerentola* and *Zelmira*. Beethoven, then living in Vienna, was, for the time being, practically forgotten in the enthusiasm for the new composer.

In 1829 Rossini composed his last opera, *William Tell*. This dignified work is his masterpiece, though it has never enjoyed the popu-



Photo: Brown Bros.

ROSSINI

larity of his gay and tuneful *Barber of Seville*. The composer lived for forty years longer, but his creative work was practically at an end. His *Stabat Mater*, a beautiful piece of church music, is the only outstanding production of this second period. He lived alternately in Italy and France, spending his last days in luxurious idleness at his country estate in Passy.

Rossini was a man of great talent, and exerted a permanent influence on the development of the opera. He established new forms of orchestral accompaniment, and increased the effectiveness of the individual instruments. His personal faults kept him from using his powers to best advantage. His indolence prevented him from inventing new themes; he was constantly patching together bits of old airs to make new ones; his unrestrained habits shocked many people; his vanity and praise of himself disgusted others. See OPERA.

ROSS SEA. See map, in article ANTARCTIC LANDS AND SEAS.

ROSTAND, *rohs tahN'*, EDMOND (1868-1918), a French writer of plays and poetry, and the son of a prominent journalist, was born in Marseilles. Rostand's first play, a comedy in verse, was produced in Paris in 1894, and was immensely successful. Both this and his later plays proved him a skilful dramatist, a satirist, and a poet. Three other plays followed in quick succession, and then came his greatest success, *Cyrano de Bergerac*, a "heroic comedy" in verse, which was produced December 28, 1897, by the famous French comedian Coquelin, who also played the leading part. The play was quickly translated into English, German, and Russian, as well as other European languages, and created a furor.

In 1900 *Cyrano* and *L'Aiglon*, whose hero is Napoleon's son, were presented in America by Sarah Bernhardt and Coquelin. Richard Mansfield produced *Cyrano* in English in the United States and Canada, and during the season 1923-1924, Walter Hampden revived it. Rostand's most conspicuous success after *Cyrano* was *Chantecler*, a fantasy of bird and animal life which was awaited with great interest and hailed with enthusiasm both in France and in America, where Maude Adams appeared as "Chantecler." Rostand was elected to the French Academy in 1902.

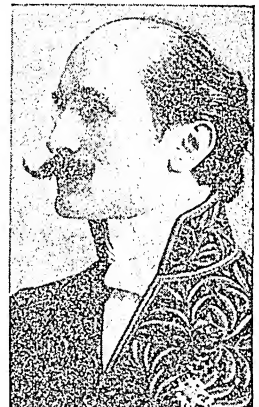


Photo: Brown Bros.

EDMOND ROSTAND

In the uniform of a member of the French Academy.

He wrote many poems, using important current events as his theme, and during World War I, unable to enter the service, he did his bit by writing patriotic verse. R.T.H.

ROSTOV-ON-DON, *rahs tohf' on don'*. See RUSSIA (Principal Cities).

ROSWELL, N. MEX. See NEW MEXICO (back of map).

ROTARY CLUBS, organizations of business and professional men, with fellowship and practical service as objects. The idea was developed by Paul P. Harris (born 1868), a Chicago lawyer, who determined to form a new kind of club for the promotion of friendships and mutual helpfulness. He decided upon a membership of only one man from each business or profession, so that the new club would be a real cross section of the business life of the community. He accomplished this in Chicago on February 23, 1905, with four men at the first meeting, a coal dealer, a mining operator, a merchant tailor, and himself. The name "Rotary" was proposed by the founder because it was planned that the members should meet at their places of business in rotation. Later, dinner and luncheon meetings were instituted.

In 1908, the second Rotary club was organized in San Francisco. From that time on the growth was rapid, and in 1910 the first sixteen clubs formed an association. The first club outside of the United States was organized in Winnipeg, Canada, in 1910; and in 1911, clubs were organized in Ireland and England. The organization has continued to develop until now there are clubs in more than fifty countries, all united in what is known as Rotary International, with its central office in Chicago, and other offices in Zurich, London, and Bombay. Annual international conventions are held. There are now more than 5,100 Rotary clubs in the world, of which 3,300 are in the United States. These clubs have a total membership which has reached a steadily increasing figure in excess of 205,000.

No member can shirk his responsibility to his local club; forfeiture of membership is the penalty for failure to attend four successive meetings without reasonable excuse. This rule, rigidly enforced, makes passive membership impossible.

The aims and objects of Rotary are:

To encourage and foster the ideal of service as a basis of worthy enterprise and, in particular, to encourage and foster:

(1) The development of acquaintance as an opportunity for service.

(2) High ethical standards in business and professions; the recognition of the worthiness of all useful occupations; and the dignifying by each Rotarian of his occupation as an opportunity to serve society.

(3) The application of the ideal of service by

every Rotarian to his personal, business, and community life.

(4) The advancement of international understanding, good will, and peace through a world fellowship of business and professional men united in the ideal of service. P.L.

ROTATION, *ro ta' shun*, OF CROPS. Agricul-
turalists have found that raising the same crop on a field, year after year, deprives the soil of its fertility, no matter how deep and rich the soil may be. An experiment conducted by the Illinois Agricultural Experiment Station affords a striking illustration of this fact. A record of the crops grown during a period of twenty years shows the following results: One plot was kept in corn for the entire period; on another, corn and oats were grown in rotation; on the third, clover was added to corn and oats. On the first plot, the yield at the end of the period was twenty-nine bushels to the acre; on the second, forty-eight bushels; and on the third, eighty bushels. At the experiment station of Tennessee, it was shown that, under a proper system of farming, the productivity of the soil was increased from twenty to eighty bushels an acre.

All fertile soil contains available plant foods—nitrogen, potash, and phosphorus—in varying proportions, and also a sufficient amount of water to dissolve these foods and supply them to the plants as fast as they are needed. One plant requires a larger proportion of some of these foods than another, and if that plant is grown upon the land year after year, the supply of this food becomes exhausted to such a degree that the plant is not sufficiently nourished to produce a good yield. Again, all plants drain the soil of its nitrogen, and unless means for restoring nitrogen are employed, the soil soon becomes infertile. The best method of restoring nitrogen is to plant clover, cowpea, soy bean, or some other leguminous plant, and to plow the crop under. This practice is called *green manuring*. By a diversified system of farming, different crops follow each other in a regular order, and no one element of plant food is drawn on more extensively than another. The fertility of the soil is maintained, and the farmer receives greater returns for his labor.

Another reason for the rotation of crops is that the continuous growing of one sort of grain or other crop contributes to the growth of weeds, insect pests, and plant diseases. Small grains should be followed by tillage crops, such as corn or potatoes, so that weeds may be killed. If the field becomes infested with the Hessian fly, for instance, raising corn, then potatoes, and then clover will rid the field of the pest. A third reason for rotation of crops is that a variety of crops assures the farmer of a better income for a period of years. No system of rotation will apply to all localities, but the following is suggestive:

First and second years, corn, planted on ground enriched by a green-manure crop previous to the planting of the first crop.

Third year, a small grain. In the wheat belt, two successive crops of wheat might take the place of the two crops of corn.

Fourth year, timothy and clover. At the end of this year the sod may be turned over and the system of rotation begun again. Some farmers, however, prefer to keep the field in timothy and clover for two or more seasons. See FERTILIZER; SOIL. C.F.C.

ROTHSCHILD (in German, *roht' shilt*), a famous family of European bankers, financiers, and philanthropists, the first great "money power" of the modern world. The family name was taken from the sign of the house "Zum Rothen Schilde," or "Red Shield," which stood in the Jewish quarter of Frankfort.

The name was first connected with great financial deals when Mayer Anselm Rothschild (1742-1812), the son of a Jewish merchant of Frankfort-on-the-Main, opened a money-exchange house in that city, and in 1806 won favor throughout Germany and Austria by caring for the fortune of the elector of Hesse-Cassel, who had fled from the invading French. Immense sums of the wealth of royalty were henceforward entrusted to him, and before his death, in 1812, he and his five sons had amassed huge fortunes. So conspicuous was the service of these sons that the emperor of Austria made each a baron in 1822.

The business at Frankfort passed to the eldest son, Mayer Anselm, and then to the sons of Karl, but upon the death of the youngest of these sons, the Frankfort house was closed. Solomon, the second son of the founder of the firm, established the famous house at Vienna, which repeatedly came to the financial rescue of European nations. His brother Nathan established the British firm at Manchester in 1798, and removed it to London in 1803. Jacob, the fourth son, was founder of the famous Paris house, and Karl, the youngest, of the one at Naples.

The power of these establishments was stupendous. They financed wars, and frequently prevented wars by refusing loans; they aided in the establishment of national education systems, such as those of Germany and France; their assistance in European industrial development can scarcely be estimated. Brief biographies of the later Rothschilds follow:

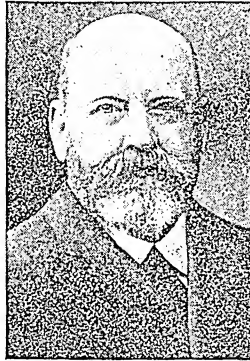


Photo: Brown Bros.

LIONEL WALTER ROTHSCCHILD

Lionel Rothschild (1808-1879), son of Nathan of London, was the main influence leading to Jewish emancipation in Great Britain. Elected five times to Parliament, he refused each time, in taking the oath, to repeat the words "on the true faith of a Christian," and this aroused such discussion that in 1858 the rule requiring the phrase was abolished.

Nathan Mayer Rothschild, first Lord Rothschild (1840-1915), son of Lionel, was born in London and educated at Trinity College, Cambridge. He sat in Parliament from 1865 to 1885, and in the latter year was raised to the peerage. At his death he was president of the British Red Cross.

Lionel Walter Rothschild (1868-1937), zoologist, eldest son of Nathan Mayer, succeeded to his father's title, but his interests were more scientific than financial. He was educated at Cambridge, and served in Parliament as a Liberal Unionist from 1899 to 1910. In 1911 he was elected to the Royal Society.

ROTOGRAVURE, *ro to grahv ure'*, a method of reproducing illustrations by an intaglio process—that is, engraving by means of lines cut below the printing surface. Both explanatory lines of type and the pictures themselves are etched on copper cylinders, and are printed from rolls of paper on rotary presses. A special kind of ink is required, which before the World War was made in Germany. American chemists learned the secret of its manufacture when the war stopped importations.

Rotogravure resembles halftone illustration to a considerable degree, but the former presents a softer-toned picture and the appearance of a glossy finish.

Daily newspapers present excellent examples of the rotogravure process in their illustrated Saturday and Sunday supplements, whose pages may be identified by either sepia or green tints in the illustrations. Many standard magazines also include rotogravure in their scheme of embellishment. See PRINTING.

ROTOR. See DYNAMO.

ROTOR SHIP, a sea-going vessel propelled by means of the action of air currents upon revolving metal cylinders. It was invented by Herr Anton Flettner of Germany, who visited America in 1926, making the trip of five weeks' duration, with his rotor ship *Baden-Baden*, solely by wind power.

The distinctive feature of the appearance of a rotor ship is its two huge cylinders of thin sheet steel, placed in the customary position of the masts or smoke funnels. These towers are about fifty feet high and ten feet in diameter, and are fitted with discs of a larger diameter than the cylinder, there being one at each end. The cylinders are placed so as to rotate freely about a central mast, and electromotors make them revolve at a speed of about 125 revolutions per minute. The principle by which the cylinders move the ship is that of the action of an air current upon a revolving cylinder, the effect of which was discovered by Professor Magnus of Berlin in 1853. The strata of air about a revolving

cylinder move with the cylinder, diminishing in force as they move outward from it. The air current, or wind, meeting this revolving air, is deflected and rarefied on one side, causing a suction which compresses it on the other side. This pressure produces the force which drives the ship. Despite its promising start, the rotor ship has never developed commercially.

ROTTERDAM, *rot' ur dam* (Dutch pronunciation, *rot ur dahm'*), the second largest city of Holland, ranking next to Amsterdam, and one of the most important commercial ports on the Continent. It is situated on both banks of the Meuse (Maas) River, twenty miles from the North Sea, and fourteen miles southeast of The Hague, by rail or canal. Large ships reach the sea two hours after leaving the port. In addition to having an extensive ocean traffic with countries overseas, Rotterdam is an important port for vessels bound to and from the Rhine provinces of Prussia, for the Meuse is the great highway from the open sea to the Rhine and the interior of Europe (see **MEUSE RIVER**). Its port facilities have been considerably increased since World War I. A large bridge carries rail and other traffic across the harbor, and every possible improvement has been made to render the waterway service excellent. The people of Rotterdam carry on an extensive trade in butter, cheese, linen, and flax, and in articles of gold and silver. The city is an important coffee market, and has an extensive transit trade in iron. Population, 612,372 (1939 estimate).

The city is divided into two parts by High Street, which is actually a dike. In the old

quarter is a dwindling number of quaint wooden buildings. The newer section contains wide, well-kept streets, lined with substantial buildings. The chief points of interest include the Church of Saint Lawrence, noted for its bronze

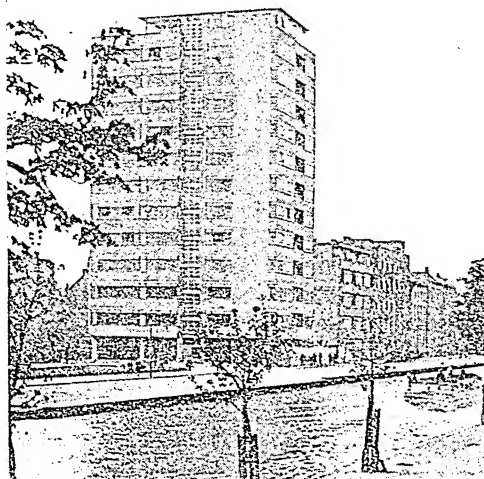


Photo: Paul

SKYSCRAPER IN ROTTERDAM

screen and great organ; the Boyman's Museum, with a fine collection of pictures and drawings by Dutch masters; the Zoological Gardens; and the house in which Erasmus (which see) was born. To the west is the suburb of Delfshaven, from which some of the Pilgrims who had taken refuge in Holland sailed for America in 1620. Rotterdam suffered heavy damage from bombs during the German invasion in May, 1940.

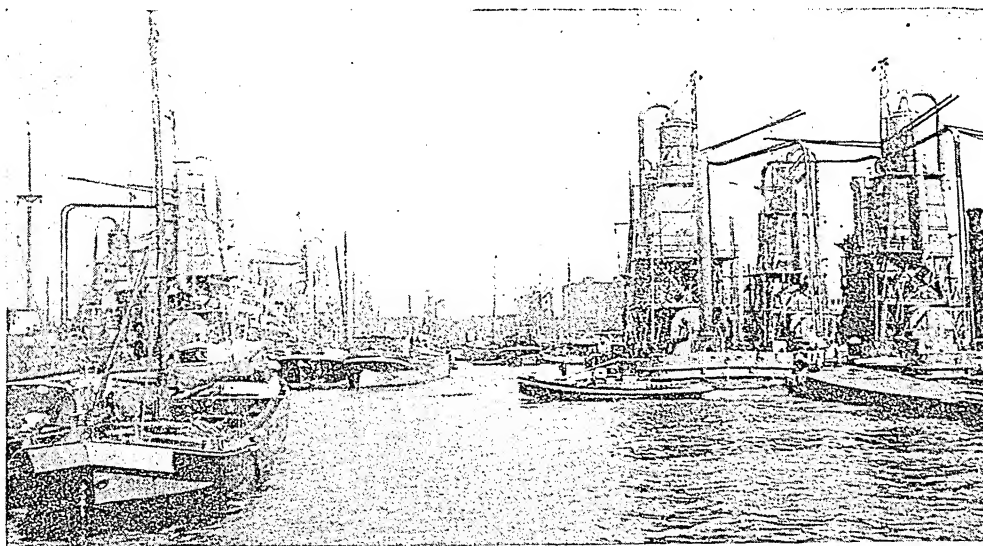


Photo: Netherlands Railways

GRAIN ELEVATORS IN ROTTERDAM

ROUBAIX, *roo beh'*. See FRANCE (Interesting Cities).

ROUEN, *rwahn*. See FRANCE (Interesting Cities).

ROUGE. See COSMETICS.

ROUGE-ET-NOIR, *roo zhay nwahr'*, the French for *red and black*, is the name of a game of chance much in vogue in Europe, especially in the gambling rooms of Monte Carlo. The players arrange themselves about a green-covered table, on which is a diagram showing four divisions upon which money may be placed as a bet. These are *rouge*, *noir*, *couleur*, and *inverse*. Six complete decks of cards are used, each player shuffling a part of the cards, and the banker shuffling them all.

The banker then deals a row of cards (face up) for *noir* until the face value of the cards aggregates or exceeds 31, the face cards counting 10 and aces 1. Then a similar row is dealt for *rouge*. The row which most nearly approaches the number 31 is the winning one, and the players who have staked on the winning color get double stakes. If the first card turned up in the deal is of the winning color, *couleur* wins, and if the contrary is true, *inverse* wins. A fresh deal, called a *refait*, is made when the number of spots is the same in each row; that is, in case of a tie. If both count exactly 31, the banker claims one-half of all stakes, a rule which gives him an advantage calculated to be equal to about 1.25 per cent on all sums staked. This game and roulette were forbidden by law in France, in 1838.

ROUGET DE LISLE, *roo zheh' deh leel*. See MARSEILLAISE.

ROUGH-ON-RATS. See ANTIDOTE.

ROUGH RIDERS, the name popularly given in the Spanish-American War to the First Regiment of the United States Volunteer Cavalry, which served in Cuba under Leonard Wood and Theodore Roosevelt. Before that time, the name had been familiar in connection

with Buffalo Bill's "Wild West Show and Congress of the Rough Riders of the World," and was applied to the volunteer cavalry regiment because that body was made up largely of cowboys and Western hunters. Roosevelt, promoted to the rank of colonel, led his Rough Riders in the charge up San Juan Hill on July 1, 1898. When the regiment was mustered out, its members formed a patriotic society known as the Rough Riders' Association, which had as

its object the perpetuation of memories of the war. See ROOSEVELT, THEODORE; WOOD, LEONARD; SPANISH-AMERICAN WAR.

ROUGH STONE AGE. See CIVILIZATION (Middle Savagery).

ROULETTE, *roo let'*, a gambling game of French origin, played first in the famous gaming rooms of Monte Carlo, and from there spread throughout the world. It is not in any way a game of skill, and though "systems" to beat the game have been invented and tried in great numbers, no one has evolved any reliable or

successful plan. It is purely a game of chance, with any possible advantage on the side of the bank. See MONACO.

The roulette table is covered with green cloth, and has a wheel in the center. The cloth is divided into spaces marked *passe*, *pair*, *manque*, *impair*, and two diamond-shaped spaces colored black and red. The wheel is divided into 37 compartments, colored alternately red and black, and numbered, not in sequence, from 1 to 36; there is one with 0. *Pair* indicates even numbers; *impair*, odd numbers; *manque* indicates the numbers from 1 to 18 inclusive; *passe*, the numbers from 19 to 36.

As played at Monte Carlo, the minimum stake is five francs, but elsewhere, stakes can be arranged to suit the players. There are innumerable ways of staking: on color, odd or even numbers, on single numbers, on groups, and many others. At Monte Carlo the *croupier*, whose duty it is to set the wheel revolv-

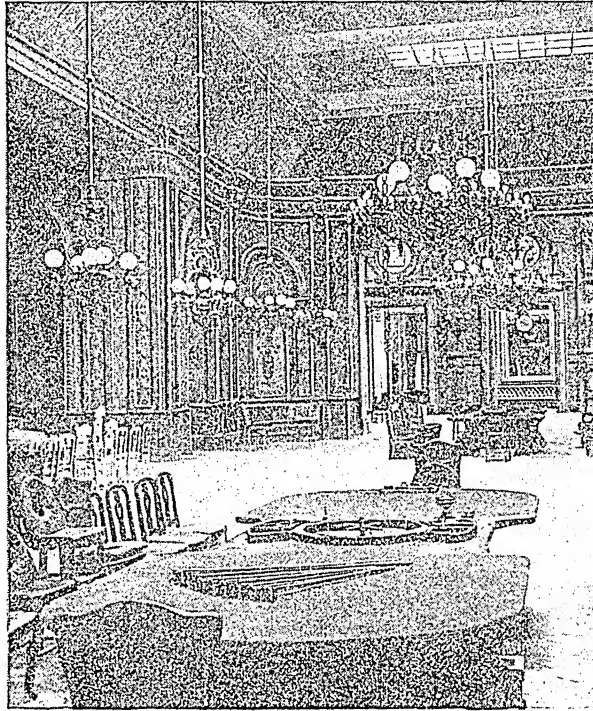


Photo: U & U

A ROULETTE ROOM IN MONTE CARLO

just below the roof. Ireland has over a hundred of these towers, and a few are to be found in Scotland and other European countries. It is supposed that they were used as places of refuge in times of danger, and they may have served as bell towers.

ROUSSEAU, *roo so'*, JEAN JACQUES (1712-1778), the man of whom Napoleon said, "Without him the French Revolution would not have occurred." It was the special work of Rousseau to preach democratic ideals and the equality of man, and the great upheaval in French social conditions, little more than a decade after his death, was in part the result of the spread of these doctrines. Rousseau was born of Huguenot parents in Geneva, Switzerland. His mother died when he was so young that he retained no recollection of her, and his education was fragmentary and of little value. When a lad he was apprenticed to an engraver, but at the age of sixteen, he ran away and went to the Duchy of Savoy, where he made the acquaintance of Madame de Warens, a lady of culture, wealth, and refinement. For the next ten years Rousseau spent most of his time in the De Warens' home, where he came in contact with some of the most brilliant intellects of Europe.

In 1741 he went to Paris, where his introduction of a new method of writing music before the Royal Academy of Sciences gained him admission to the houses of the most intellectual families of the city. He became secretary to the French minister at Venice, but the condescending attitude of his employer so wrought upon Rousseau's sensitive nature that he gave up his position and returned to Paris, where he attempted to bring suit against the minister. He soon learned, however, that a common man could not obtain redress from the aristocracy.

This was the turning point in Rousseau's career. He began to give attention to the philosophy of government and to social conditions, and during the next fifteen years, he produced a series of works which revolutionized the thought of Europe.

Rousseau was a man of marked contrasts, a character "in whom, probably beyond all others, is to be found the greatest mixture of strength and weakness, of truth and falsity, of that which is attractive and that which is de-



JEAN JACQUES ROUSSEAU
The son of a watchmaker who became one of the most powerful influences in history.

testable." In an age boastful of its intellectual brilliancy and dominated by artificial life, he sounded the call "Back to Nature" with such force that his cry was heard and heeded. Ideals such as he professed did not, however, keep him from placing his five children in a foundling hospital, and he often gave a vulgar exhibition of churlishness, vanity, and self-consciousness.

Representative Writings. Among his works are *Discourse on Inequality*; *Julie, or the New Heloise*; *The Social Contract*; and *Emile*. The last was one of the great books in the field of education, and many of the principles set forth in it were adopted by Pestalozzi and Froebel. The story of Rousseau's life is told in his *Confessions*, which are remarkable for their unsparing candor. R.T.H.

ROUTHIER, ADOLPHE. See CANADIAN LITERATURE (French Canada: Fiction).

ROWAN, ro' an, TREE. See MOUNTAIN ASH.

ROWE, NICHOLAS. See POET LAUREATE.

ROWING, the act of propelling a boat along the surface of water by means of oars. Rowboats, with rudders for steering, were used earlier than 3000 B.C. The ancient Greeks and Romans traveled in great galleys with rows of oars one above the other, manned by slaves who were chained to their places. In Britain the Saxons were famous oarsmen, and so were the invading Danes and Norwegians.

In 1715, modern boat-racing had its beginning. An English comedian, Thomas Doggett, instituted a contest which is still an annual affair, by offering a prize to the winner of the race. Amateur rowing as it is known to-day began on the Thames River, in England, about the year 1800, with informal races between six- and eight-oared boats, whose owners constituted a club. The first race between Oxford and Cambridge universities took place in 1829, and since 1856 this race has been an annual event. England's most important amateur regatta is held every year at Henley, on the Thames.

Australia holds an annual regatta, called the Australian Henley, and all of the European nations have amateur rowing associations similar to those of England. Canadian rowing has made great progress. In 1928 a Canadian single sculler won the *Diamond Sculls* at Henley. Harvard and Yale universities have led in this sport in the United States since 1843-1844. The chief regatta is held on different courses in different years by the National Association of Amateur Oarsmen, founded in 1872. American rowing crews have competed bravely with the English both in the United States and abroad, but the English have almost always won until recently.

From 1910 to 1925, the United States showed the best class of rowing of any country. This statement is easily understood when it is

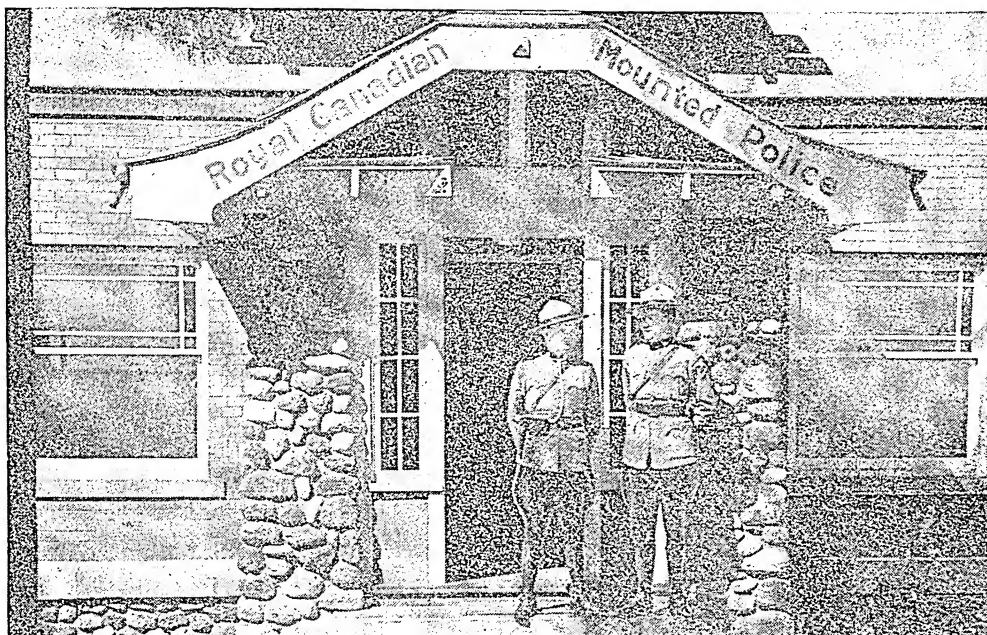


Photo: James Sawders

HEADQUARTERS OF THE ROYAL CANADIAN MOUNTED POLICE AT BANFF, ALBERTA. (SEE CANADA [color plate])

These red-coated men are members of what has been termed the finest police system in the world. Their slogan is, "Get your man."

remembered that World War I eliminated all rowing events on the Continent, and that boys in England had little practice in rowing. The United States navy crew won the race in the Olympic regattas in Antwerp, in 1920, and Yale won in the Olympic regattas in Paris, in 1924. One of the finest crews which ever won the Grand Challenge Cup at the Henley regatta was that of the Harvard Athletic Association, Boston. American crews have almost as many styles of rowing as there are coaches. The English have only one accepted style.

In 1928, at Antwerp, the University of California crew won the eight-oared race and Philadelphians won the double-sculls. In the 1932 Olympics, at Los Angeles, the United States won the double-sculls, pair-oared with coxswain, and eight-oared races; and in the 1936 Olympics at Berlin, the eight-oared event.

Terms Peculiar to Rowing. The light boats used in racing are called *shells*. They are built for two, four, six, and eight oarsmen and are known as *pairs*, *fours*, *sixes*, and *eights*. In England the single rower, using two oars, is called a *sculler*, and the oars are called *sculls*. *Double scullers* are common in the United States, but not in England. English shells, and most of those constructed in the United States, are built with sliding seats. The sliding seat is undoubtedly more exhausting than the fixed seat. See CANOE AND CANOEING.

ROYAL, MOUNT. See MONTREAL.

ROYAL ARCANUM. See FRATERNAL SOCIETIES (Membership).

ROYAL ARCH MASONS. See MASONRY.

ROYAL CANADIAN MOUNTED POLICE. Popularly known throughout Canada as the "mounties," this splendid organization of mounted police has long had an important part in the maintenance of law and order in the Dominion. Its history goes back to the year 1869, when the Hudson's Bay Company gave up its territorial rights in the Canadian Northwest to the Dominion government. The acquisition of a great section of sparsely settled territory, extending about 900 miles from east to west, and somewhat more from north to south, brought with it serious problems. The Red River Rebellion and minor disturbances in the Northwest showed the need of some control over the section, if it was ever to be open to permanent settlers. To Sir John A. Macdonald belongs much of the credit for the idea of a mounted police force and for its successful adoption, although the force was actually organized during Alexander Mackenzie's Ministry.

The Act of Parliament establishing the force provided that all the police were to be mounted and efficiently equipped, but with as little brilliant display as possible. No person was to be appointed to the force unless he were of sound constitution, able to ride, active and able-bodied, of good character, and between the ages of eighteen and forty years; nor could he be a member if he were unable to read and

write the English or the French language. The minimum age was later increased to twenty-two. From the very first, the mounted police force attracted a high grade of men. University men and sons of peers served in the ranks with the humblest. One of the best-known names in the English language, Dickens, appears in the record of the force, because Francis Dickens, a son of Charles Dickens, was for several years an inspector.

The organization of the force was begun in the autumn of 1873. By October about 150 men had been sent to the temporary headquarters at Fort Garry, and on June 4, 1874, three divisions (about 200 men) left Toronto for the Northwest by way of Chicago, Saint Paul, and Fargo. From Fargo they proceeded on horseback westward to the Saskatchewan. The hardships of this overland march are a part of the history of the great Northwest. How the police established their posts, how they broke up the illegal trade in whisky and stolen horses and cattle, how they won the fear and later the confidence of the Indians, how they really made possible the settlement of the Territories—these are familiar stories to every Canadian school child.

The original name of the organization was Northwest Mounted Police. In 1906 the name Royal was added, and in 1920 the title was changed to its present form. At this time, the force was amalgamated with the Dominion police. By 1941 the number of officers and men had reached 4,154. Recruits whose term of enlistment is for five years are trained in the police college at Regina.

The field of action of the Canadian "mounties" now covers the entire Dominion. The headquarters and a reserve squadron are at Ottawa, Ont., the Dominion capital. Other squadrons are stationed at Vancouver, B. C., Macleod, Alta., Regina, Sask., and Brandon, Man. The force is divided into thirteen main divisions, each of which is commanded by a superintendent, who has under him a number of inspectors and other officers. Surgeons and veterinary surgeons are commissioned officers. The non-commissioned officers, as in the British army, are staff sergeants of various kinds, sergeants, and corporals. The troopers are called constables. Since the amalgamation with the Dominion police, the force has included unmounted men. Each of the district headquarters maintains communication with all posts in its district, and is responsible for their direction to the central headquarters at Ottawa. The most remote detachment is on Herschel Island, in the Arctic Ocean, near the mouth of the Mackenzie River. This post is 2,500 miles from the Regina headquarters. In winter dog teams are used to reach it. Motor vehicles now outnumber horses four to one, and the "mounties" even employ airplanes.

Duties. There is scarcely a department of the Canadian government that is not assisted by these hardy troopers. Along the United States border, they act as customs officials, preventing smuggling. They carry the mails to the distant settlements, they report on the condition of the roads, bridges, crops, and weather, they fight prairie and forest fires, they take the census, and they often act informally as arbitrators or judges between settlers who have had disputes. They help travelers and are frequently called on to take care of the sick or injured. For example, in the winter of 1904, word came to the police at Fort Chipewyan that a missionary had become insane at Peace Station. Constable Pedley took the madman to Fort Saskatchewan, 500 miles away by trail. This was in the dead of winter, with the temperature often fifty degrees below zero, with terrible storms, during one of which Pedley had to lash himself and the missionary to a tree.

These duties, of course, are merely incidental to the main purpose of the force, to preserve law and order. In many of the remote districts, they not only preserve the law, but they frequently make or interpret it. The commissioned officers make regular trips to hold court. In tracking criminals, these men have difficulties which seem almost insuperable. Only a handful of men to patrol thousands of square miles! Yet no detective or police force in the world can show a better record, and the efficiency of the police has earned for it the fear of all criminals and the admiration of all good citizens. The police regularly patrol all settled districts in the Northwest Territories and Prairie Provinces. In the Maritime Provinces they have been of assistance to both fishermen and the Dominion's Department of Fisheries. During World War II their duties were extended to include the registering of enemy aliens; the protecting of government buildings and dockyards; and, with the Canadian Militia, the guarding of defenseless points. The force is responsible to the Minister of Justice.

For a few years, the Indians were the worst trouble-makers in the Northwest, but even in its early days, the police force had tremendous influence. An episode occurring shortly after the close of the Saskatchewan Rebellion is a good illustration:

A band of 200 Indians, who feared punishment for their share in the rebellion, fled across the border into the United States, where they met a cold welcome. The official wires were kept hot for a few days between Ottawa and Washington, and much correspondence ensued, until it was finally agreed that Canada would be responsible for the band if the United States would kindly escort it to the border. In due time, 200 wild-eyed Crees, with 450 horses, were headed northward in charge of a strong force of United States cavalry. At the boundary line, they were met by three mounted policemen—one corporal and two troopers—who had with them

one extra horse. The American commander looked at them in surprise.

"Where's your escort for these Indians?" he asked.

"We're here," answered the corporal.

"Yes, yes, I see. But where's your regiment?"

"I guess it's all here," replied the corporal. "The fourth man's looking after the breakfast things."

And the four "mounties" took over the band of Indians, and escorted them a hundred miles farther, where they could give Uncle Sam no more trouble. G.H.L.

ROYAL GORGE, THE, a canyon of the Arkansas River, ten miles from Cañon City, Colo. This gorge, in places more than 3,000 feet deep, is the most remarkable chasm in the world through which a railroad passes. At some points, the canyon is not over thirty feet wide. In order to provide for the track, it was necessary to build many bridgelike structures parallel to the walls of the gorge. The advantage of this roadway is that it provides a water-level route through a very mountainous section.

The highest bridge in the world (1,050 feet above the water) spans the gorge. See **ARKANSAS RIVER**; **COLORADO**; next page.

ROYAL HOUSEHOLD OF GREAT BRITAIN, the personal attendants upon the reigning sovereign. The head of the royal household is the lord steward. Under him are the treasurer, the controller, the master of the household, and various officers and servants. Included also in the royal household are the officers of the chapel, the chamber, and the stable. The attendants of the queen are headed by the mistress of the robes, under whom are the ladies of the bedchamber, maids of honor, and other attendants. The queen's personal attendants are the ladies of the bedchamber.

ROYAL INSTITUTION, a scientific society founded in England in 1799 and chartered in the following year. Its object is to encourage research and diffuse knowledge. Many brilliant scientists have been connected with the Institution since its foundation. These include Thomas Young, who established the wave-motion theory of light; Sir Humphry Davy, the inventor of the safety lamp for use in mines; Michael Faraday, one of the greatest figures in the history of electrical research; John Tyndall, who made valuable contributions to the world's knowledge of heat phenomena; Edwin Lankester, a specialist in the field of sanitation; and Lord Rayleigh, who, in conjunction with Sir William Ramsay, discovered the element argon. The Institution provides for evening lectures, at which the public may hear discussions of the latest discoveries of eminent scientists. There is a library of 60,000 volumes.

ROYALISTS, the partisans of Charles I and Charles II in that period of English history when the Commonwealth and the Restoration were the uppermost interests in the country; another term for them was Cavaliers (which see).

ROYAL METALS. See **AFFINITY**.

ROYAL RANCH. See **ALBERTA** (Farming and Ranching).

ROYAL SOCIETY, THE, the oldest scientific society in Great Britain and the most famous in the world. The full title is *The Royal Society of London for Improving Natural Knowledge*. The organization was incorporated with the sanction of Charles II, in 1662, but there was a nucleus as early as 1645. In that year, weekly meetings of London scientists were held, and their work and discussions were so learned that even in 1646 the association was sometimes called the "invisible college." Within a year after incorporation, it was carrying on active correspondence on learned questions with the philosophers and scientists of France, Germany, Spain, and Italy, and in 1664 began the publication of its *Transactions*.

Within ten years after its incorporation, the Society published such valuable results of its research work that it was recognized as semi-official by the British government, and was given many important scientific commissions. In 1671, the year Sir Isaac Newton was elected a fellow, it was charged with the direction of the Royal Observatory at Greenwich, and this duty was followed by such undertakings as the correcting of the calendar in 1752, the protection of British ships from lightning, the measurement of a degree of latitude, the Antarctic Expedition of Captain Cook in 1772, the Arctic expeditions under Parry in 1819, Sir John Franklin in 1845, and Nares in 1875, the determination of the density of the earth, and the accurate comparison of the metric and English systems of weights and measures. The Society practically controls the National Physical Laboratory, many scientific trust funds, and the governing bodies of several schools.

Other Royal Societies have been established from time to time in various parts of the British Empire, notably the Royal Society of Canada, founded in 1881. It consists of five sections, covering the natural sciences, literature, history, and economics. It publishes annual *Transactions*, awards gold medals for outstanding achievements in scholarship and research, and maintains traveling fellowships. Its membership is limited in numbers and highly prized as a recognition of unusual merit. Other Royal Societies are in Australia, South Africa, and Edinburgh. In London there are several Royal Societies devoted to particular fields.

ROYAL SUPREMACY. See **SUPREMACY**, **ROYAL**.

ROYAL WATER. See **GOLD** (Gold in Chemistry).

ROYCROFT. See **HUBBARD**, **ELBERT**.

ROZHDESTVENSKY, *rozh dest ven' skie*, **ZINIVY PETROVICH**. See **ROJESTVENSKY**, **SINIVY PETROVICH**.

RUBAIYAT, *roo bi yaht'*, an Arabic word, used to designate any collection of quatrains,



The Royal Gorge. At left, the remarkable chasm, as seen from the top; from Cañon City this point is reached by a ten-mile drive. At right, a train passing through the gorge. (See page 6221.)

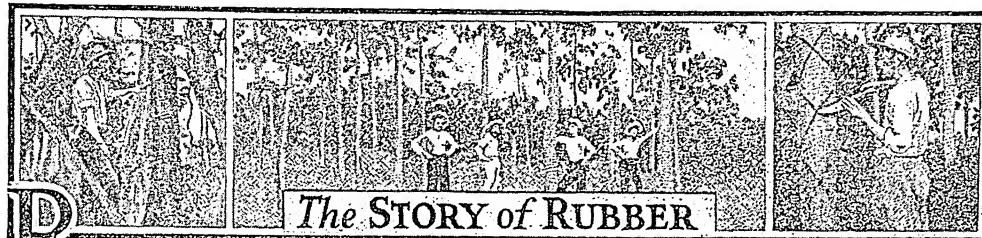
or four-line stanzas. In English, however, it is applied almost exclusively to one series of such verse—that of Omar Khayyam, translated by Edward Fitzgerald (see OMAR KHAYYAM; FITZGERALD, EDWARD). Several other English versions of the Rubaiyat have been issued, but that of Fitzgerald is by far the most popular, and justly so, for it is more than a translation; it is a genuine English poem, exquisite in its diction, yet reproducing most faithfully the spirit of the old Persian writer. Fitzgerald at times took liberties with the wording of his original, but never with its spirit, and the

result is unique among translations. The following stanza is no less typical of the philosophy of the poem than of its manner:

Come, fill the Cup, and in the fire of Spring
Your Winter garment of Repentance fling:
The Bird of Time has but a little way
To flutter—and the Bird is on the Wing.

The stanza which is most quoted probably is the twelfth:

A Book of Verses underneath the Bough,
A Jug of Wine, a Loaf of Bread—and Thou
Beside me singing in the Wilderness—
Oh, Wilderness were Paradise enow!



RUBBER. If all the rubber resources in the world were suddenly destroyed, what would be the effect of the disaster? Before long there would be no rainproof coats and shoes for pedestrians on stormy days, no tires for automobiles, no rubber ice bags or hot-water bottles for the sick, no battery jars, no hose for the fire department, no insulation for ocean cables, no packing for steam engines, no life-saving air brakes. One could go on indefinitely, enumerating the comforts, conveniences, and luxuries modern civilization owes to rubber. Even war cannot be waged without this commodity, for transportation for military operations is on a rubber-tire basis.

What Is Rubber? The raw material itself, the chemist tells us, is a compound of hydrogen and carbon, mixed with small amounts of resins, mineral matter, and proteins. The botanist describes it as a substance found in the milky juice, or latex, of various trees, shrubs, and vines that grow chiefly in hot countries. Latex is not a true sap, but it bears a resemblance to the juice that oozes from the broken stem of the milkweed, which almost everyone has seen. This latex is secreted in the inner layers of bark, and oozes out, drop by drop, through cuts made in the bark of plants secreting it. The fluid, in fact, is poured out to heal the wounds. When a quantity of latex is collected and allowed to stand, the tiny globules of rubber rise to the top, leaving a watery liquid beneath, just as cream rises to the top of milk. From this top deposit, which is mainly crude rubber, are derived the innumerable articles that affect our lives in so many ways. There are numerous steps, how-

ever, between crude rubber and the finished rubber product, and the whole story of rubber goes back hundreds of years.

How Rubber Came to Be Known. The story of rubber really begins with the second voyage of Columbus. When the great explorer landed on the island of Haiti, he saw the native boys playing games with odd-looking balls that had a remarkable bounce. These balls, Columbus learned, were fashioned from the hardened juice of trees, and he carried a few home to Spain as curiosities. Later, the Spanish conquerors of Mexico found the natives wearing shoes made of cloth dipped in latex, and the Spaniards themselves learned to coat their garments with the juice to make them waterproof. Later, a Portuguese missionary, penetrating the wilderness of the Amazon, in Brazil, found the Indians there using shoes made of the same gummy substance.

In 1731, when the Paris Academy of Science sent an expedition to South America, the latex of the species growing along the Amazon was studied scientifically and the tree identified as the hevea (*Hevea brasiliensis*), a plant of the spurge family, related to the castor bean. The natives in the Amazon region called the plant by a name meaning *weeping tree*, and the French spelling of the word, *caoutchouc* (*koo' chook*, or *kou' chook*), is still widely used for rubber, except in English-speaking countries. The name rubber is credited to the English chemist Joseph Priestley, who, in 1770, stated that the elastic gum was an excellent material for rubbing out pencil marks. Because it was first discovered in the West Indies, the gum became known as India rubber, but the India part of the name has fallen into disuse.

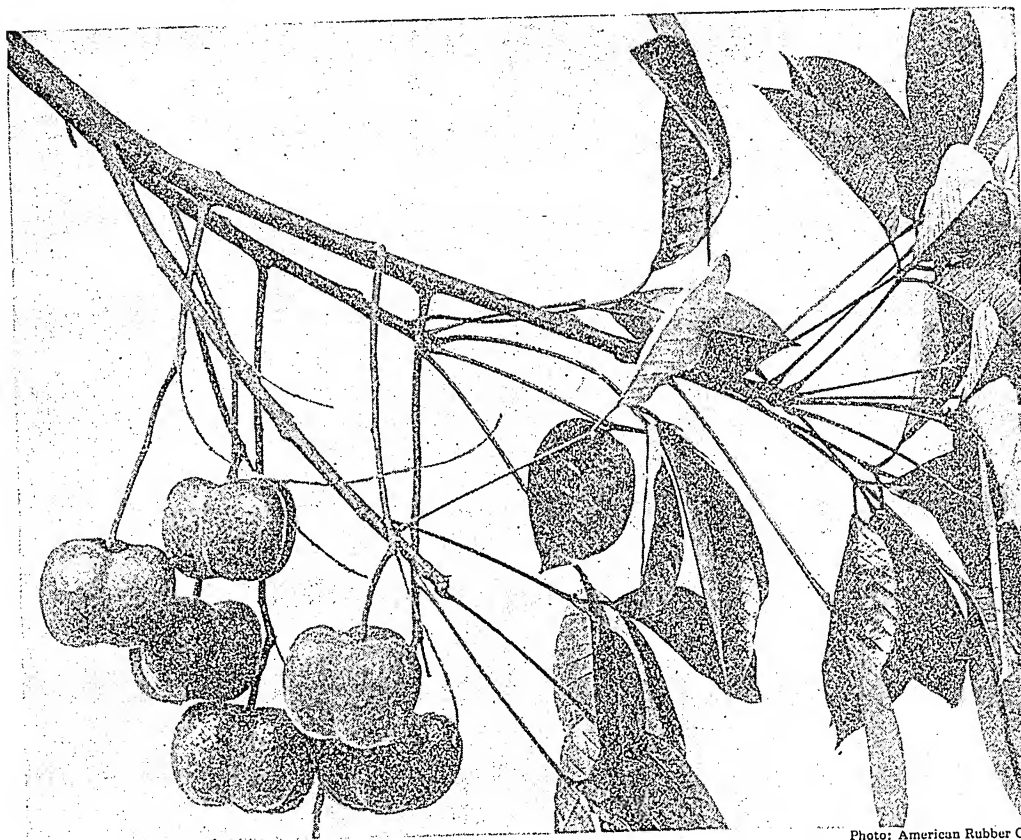


Photo: American Rubber Co.

THE RUBBER PLANT

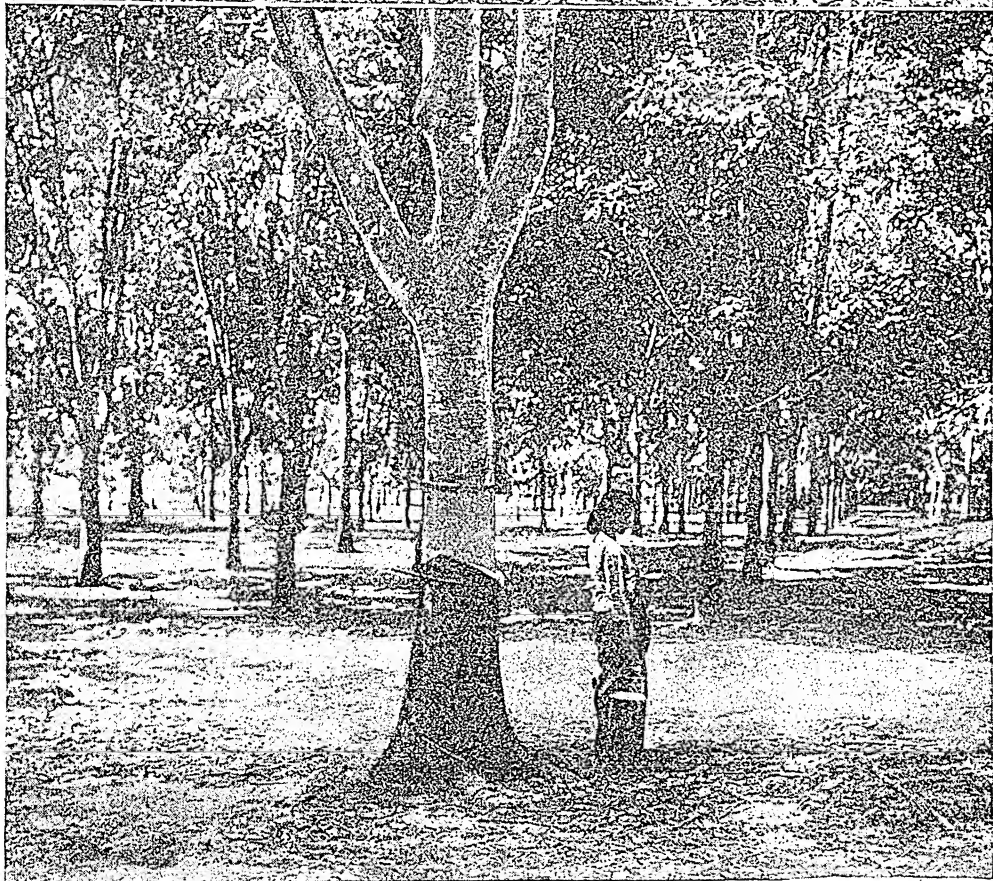
The illustration shows the pods and leaves about three-fourths size. Each light-green pod contains three dark-brown seeds. When the seeds are ripe, the pods burst with a fairly loud report, and the seeds are widely scattered.

Growth in Importance. By the year 1800, Brazil was carrying on a profitable trade in rubber shoes, bottles, and other products, and in 1823 the Scotsman who has left us his name in the raincoats called mackintoshes took out his patent, which was for placing a very thin sheet of rubber between two layers of cloth. Meanwhile an Englishman, Hancock, had discovered that pure rubber can be made into blocks or sheets of any shape by mechanical pressure. But in spite of all these ingenious uses, rubber would have remained of minor importance had it not been for a fortunate incident that occurred in America in 1839.

The rubber goods made in those early times would seem ridiculous to-day. They were ordinarily rather sticky, and in hot weather very much so, while in cold spells, they became stiff and somewhat brittle. Charles Goodyear, a Connecticut inventor whose story is told in another volume, made an end of this weakness when he discovered, by accident, that rubber mixed with sulphur and then heated to the melting point retains its characteristic qualities, being no longer affected by

temperature, and cannot be dissolved, as before, in naphtha, turpentine, or chloroform. To Goodyear's process someone gave the name *vulcanization* from Vulcan, the ancient Roman god of fire (see GOODYEAR, CHARLES). Out of this discovery the great rubber industry of modern times developed.

Sources of Crude Rubber. Most of the rubber of commerce is derived from the hevea tree, which grows wild in enormous forests of the Amazon Valley and other sections of South America, and has been extensively planted elsewhere. Also abundant in Brazil is a species of *Manihot*, plantations of which have been established in Africa, India, and Ceylon. From Colombia, Ecuador, and Central America comes a rubber derived from a species of *Castilloa*. Tropical Africa is the home of various creeping shrubs (*Landolphia*) that furnish a marketable product, including Congo, Madagascar, and other types of rubber. The guayule plant, abundant in Mexico and Central America, and also grown in Southern California, furnishes a rubber contained in the bark and wood in solid form. Other rubber plants are



Photos: American Rubber Co.

In the East Indies. Below, a woman worker gathering latex. She has just emptied a cup into her collecting can, and is on her way to the next tree. Above, a group of coolies waiting to receive their wages.

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found in various sections of the tropics. None of these plants, however, approaches the hevea tree in importance.

When the vulcanizing process gave new impetus to the production of rubber, the industry developed on a large scale in Brazil, because the hevea tree was found to produce the best grade of crude material. No attempt was made to cultivate the trees on plantations, and a shrewd Englishman, Henry Wickham, impressed by the ease with which the plants reproduced from seeds, wrote a book advocating their systematic propagation. As a result, he was commissioned to take a selection of seeds to the Kew Botanical Gardens, near London. Here they were planted, and in August, 1876, several thousand vigorous seedlings were on their way to Ceylon. Four years later, the first trees were tapped, and cultivated rubber had become a product of Asia. When the automobile industry began making its extraordinary demands on the world's rubber output, plantations of *Hevea*

brasiliensis were established in the Straits Settlements, the Federated Malay States, Java, Sumatra, and Borneo. These regions now produce over ninety per cent of the world's output of crude rubber. Brazil lost its supremacy after 1912.

How Crude Rubber Is Obtained. Latex is obtained from the trees by tapping; that is, grooves are cut in the bark and the juice is collected in cups. The grooves may be made as indicated in the illustration, or they may be slanted downward on the opposite sides of a vertical channel, a method called the herring-bone system. Sometimes the grooves run spirally around the trunk. In accordance with modern plantation practice, regularly on every second day the tapper revisits a tree to widen the grooves and expose new surfaces for the flow of the juice. On the plantations, care is

taken not to injure the wood, and only a part of any tree trunk is uncovered in one season. The trees then cover the raw surfaces with new bark, and in some cases, the plants go on bearing for thirty years and more.

Tapping is done in early morning, before the sun is hot enough to harden the latex and check its flow. It ordinarily runs (actually, drop by drop) for an hour after the cut has been made. Then the contents of the cups are poured into

cans, and the product is taken to a central station for coagulation. The great plantations of the Far East employ methods far removed from the Brazilian process of extracting the wild rubber. In the old days, the rubber-gatherer of the Amazon jungles would dip a wooden paddle into the juice and hold it over a smoldering fire of leaves and nuts until the liquid had evaporated and a film of rubber was left on the paddle. From repeated dippings were formed the large black balls, or "biscuits," of crude rubber that made their way to foreign markets under the name of *Para rubber*, so

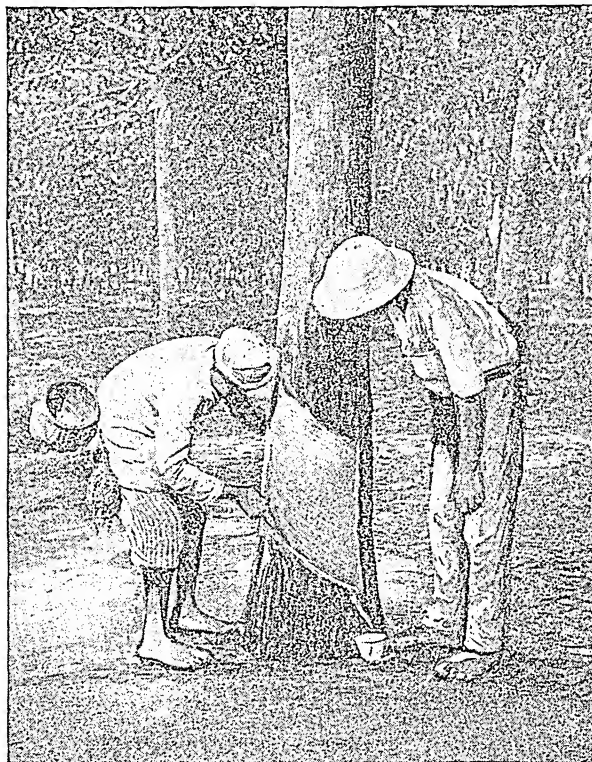


Photo: American Rubber Co.

TAPPING A RUBBER TREE

called because shipped from the city of Para.

On most of the Asiatic plantations, the collected latex is poured into vats containing more than an equal volume of water, and the rubber is coagulated by the action of dilute acetic acid. The rubber particles form thick, doughlike sheets that are put through several processes of squeezing between rollers, washing, and drying, variations in the methods giving sheets of different color, elasticity, etc. These are known as *smoked sheet*, *pale crêpe*, *amber blanket crêpe*, and the like.

Although the coagulation method described above is a vast improvement over the old Brazilian system, it does not insure absolute purity or uniformity of product, and a still more advanced method, called the *spraying process*, has been worked out by an American rubber company operating large plantations

in the East Indies. The latex, poured into a huge steel tank, is allowed to trickle down through a pipe upon a rapidly revolving disc, which throws off the liquid in a fine white mist. The rubber particles, dried instantly by inflowing heated air, settle like snowflakes on immense trays mounted on casters, which are wheeled away as they become full. So efficient is the speeding disc and dryer that the "flakes" accumulate at the rate of about 600 pounds per hour. This sprayed product is free from acids and impurities, is uniform in quality, and has great tensile strength. A method has also been developed for using latex directly in the manufacture of some rubber products.

Rubber Manufacture. Although the Far East holds a monopoly of rubber production, at least three-fourths of all rubber products are manufactured in the United States; Akron, O., is the leading rubber-manufacturing city in the world.

Among particular lines of manufacture, that of automobile tires is far ahead of all others. As carried on in a modern factory, the making of rubber products is a complicated process involving many separate operations. Unless the crude material is entirely free from impurities, it must undergo a cleansing process in the factory, first being steamed into a soft mass, then passed through sets of corrugated rollers played upon by streams of water, and finally exposed to the heat of vacuum driers or other apparatus.

From the driers the cleansed rubber goes to the mixing mills. The manifold products derived from rubber cannot all be made from the same raw material, for these products must have varying degrees of hardness, stiffness, elasticity, resistance to pressure and blows, to oils and acids, to changes of temperature, and so on. Such qualities are imparted by the addition of different ingredients called pigments; by mixing raw rubber with certain pigments before vulcanization, the manufacturer is able to secure just the compound he needs for any particular product.

The materials used include, besides sulphur, such substances as zinc oxide, chalk, mineral dyes, vaseline, tar, and hundreds of others, all of which must be carefully weighed; the rubber compounds are built up from rigidly calculated formulas.

When the dried rubber has been reduced to a plastic mass, the other materials are poured in, and the batch is passed through a set of hot rollers until the ingredients form a uniform

mixture. The batch comes out of the mixing mills in the form of a flat sheet about a quarter of an inch thick. This is cut off into slabs measuring about three feet by six, which are placed in racks to cool. The prepared rubber is then ready for the processes that transform it into usable products.

It is obviously impossible here to describe all the operations that enter into the fashioning of rubber products; one American company advertises that it alone turns

out over 30,000 different rubber articles. Rubber goods may be divided in a general way into the two classes of hard products and soft products. The former contain large amounts of sulphur, and are subjected to heat a longer time than soft products. There are all manner of gradations in both general groups.

Some articles are formed and vulcanized in metal molds, and some are fashioned before they are subjected to the final heating, or "curing," process. Every year new and improved methods are perfected, whereby serviceability is increased, and cost, if possible, is reduced. Especially have improvements been made in automobile tires, which normally consume so large a proportion of the rubber supply. Processes, too, have been developed for reclaiming the rubber in worn-out shoes, tires, hose, and other articles once regarded as waste. Used in mixtures, reclaimed rubber takes the place of a definite quantity of new rubber, and to that extent is a means of lowering cost. Rubber can be manufactured synthetically from isoprene, a hydrocarbon from turpentine, and it can be made from the starch of potatoes,

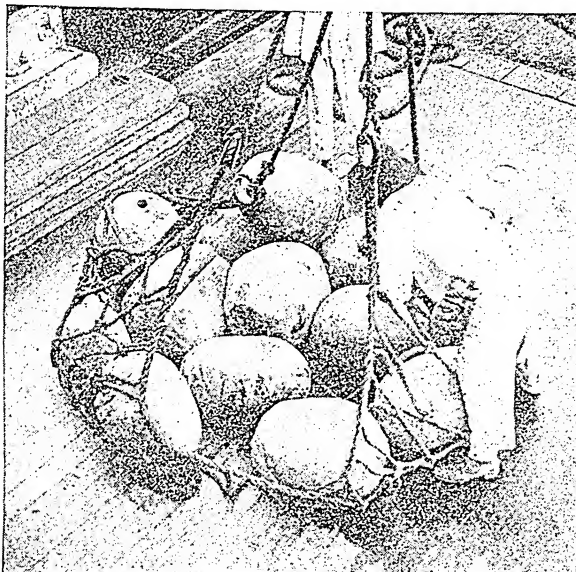
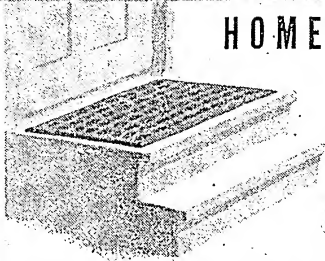


Photo: Visual Education Service

BALLS OF RUBBER FOR EXPORT

In the form shown above, crude rubber is exported from Brazil.

HOME USES



DOOR MATS AND NONSKID MATERIALS



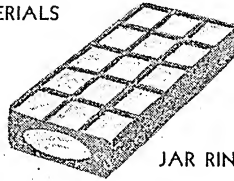
RUBBER BANDS



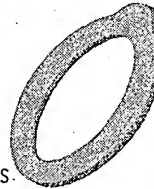
MATTRESSES AND CUSHIONS



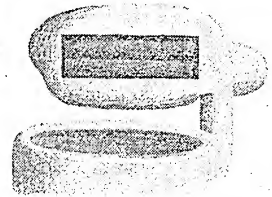
SPORTS SHOES



ICE CUBE TRAYS



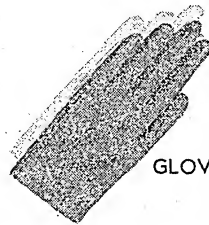
JAR RINGS



WRINGERS



FOOD COVERS

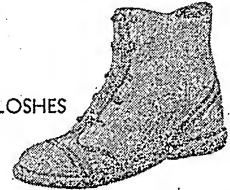


GLOVES

BOTTLE NIPPLES

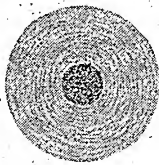


GALOSHES

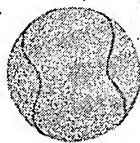


RUBBER

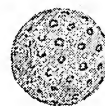
PLAY USES



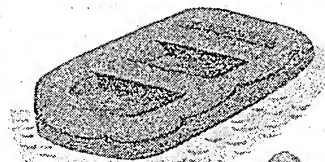
BASEBALL CORES



TENNIS BALLS



GOLF BALLS



PNEUMATIC BOATS



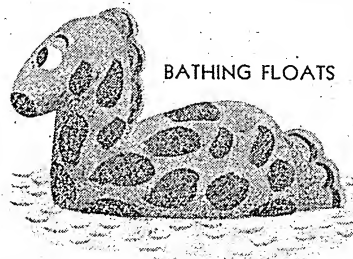
WADERS



BATHING SUITS



TOYS

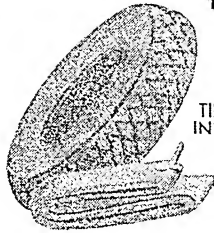


BATHING FLOATS

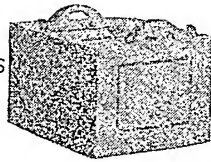


BALLOONS

INDUSTRIAL USES



TIRES AND
INNER TUBES



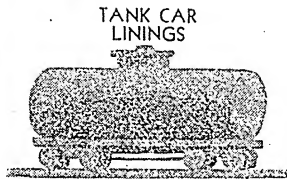
BATTERY BOXES



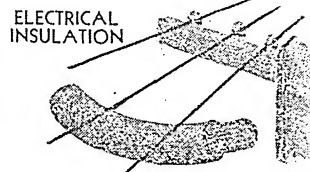
TRANSMISSION
BELTS



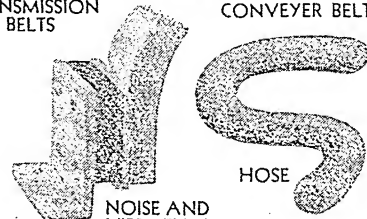
CONVEYER BELTS



TANK CAR
LININGS

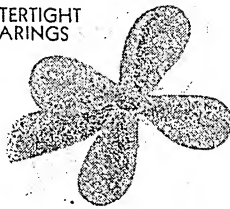


ELECTRICAL
INSULATION

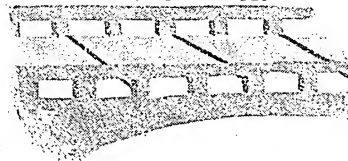


HOSE

WATERTIGHT
BEARINGS



PAVEMENT EXPANSION
JOINTS FOR BRIDGES



NOISE AND
VIBRATION
INSULATORS

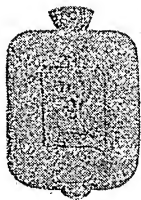


CATERPILLAR
TREADS

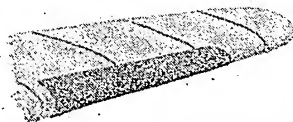


PRODUCTS

OTHER USES



WATER BOTTLES



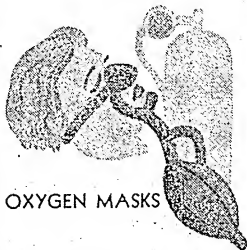
AIRPLANE WING DE-ICERS



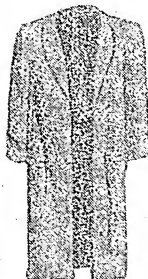
PIPES



PAINT



OXYGEN MASKS



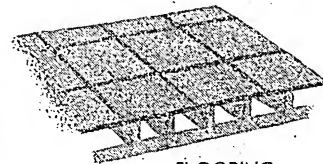
RAINCOATS



DIVING SUITS



ERASERS



FLOORING

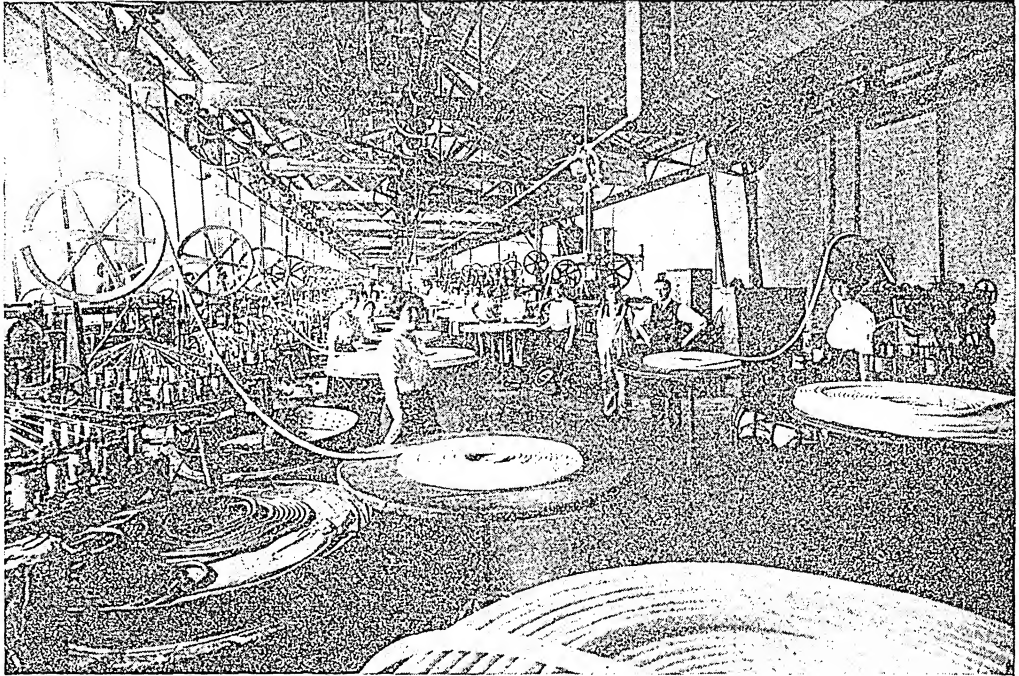


Photo: Visual Education Service

MAKING RUBBER HOSE

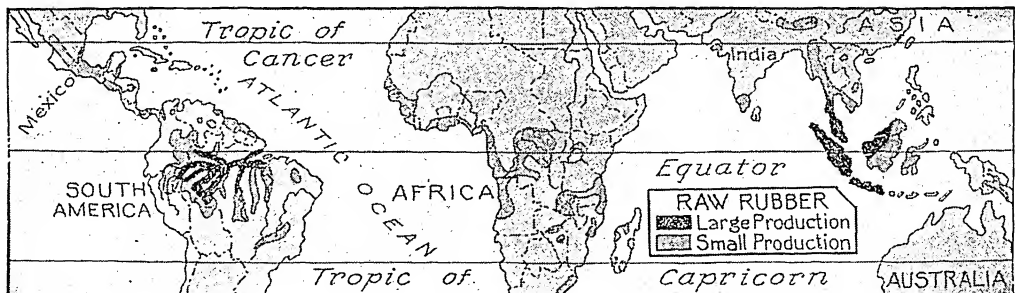
The coils of hose are shown being fed into machinery which weaves on the outer jacket. This photograph was taken in a rubber factory in Wilmington, Del.

corn, and other plants. Due to wartime needs, in 1942 production of tires for civilian needs was sharply restricted. To conserve rubber and the tires already in use, periodic tire inspection was established, a 35-mile speed limit was set up, gasoline was rationed, and scrap rubber salvaged.

The Many Uses of Rubber. In modern civilization rubber is indispensable. A nonconductor, it is widely used as an insulator on wires transmitting electricity through the air and under water. One of the outstanding industrial products is the 10,000-foot conveyor belt used at Grand Coulee Dam on the Columbia River. Travel by automobile, railroad, airplane, and submarine depends on rubber. The surgeon

has long utilized rubber as has the miner, the chemist, and the manufacturer. Some of the more important and familiar of over 35,000 uses of rubber are given in lists on a full page in connection with this article.

Production. During the decade following 1910, the world's production of crude rubber more than quadrupled. In 1910 about ninety per cent of the yield was wild rubber; at the beginning of World War I, about half of the output was plantation rubber; and plantation rubber, chiefly from Malaya, Ceylon, and the Netherlands Indies, was 92 per cent of the total by 1921. Production reaches a total over 1,000,000 tons a year. Thousands of tons of reclaimed rubber are produced also. The



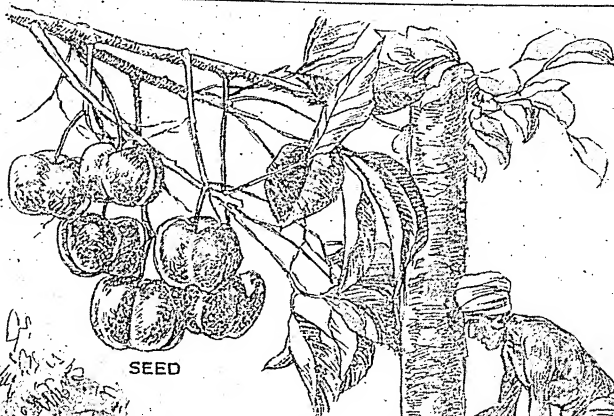
RUBBER-PRODUCING AREAS OF THE WORLD

The best rubber is from trees grown within ten degrees of the equator.

RUBBER GROWING



TREE - 14 MONTHS OLD



SEED



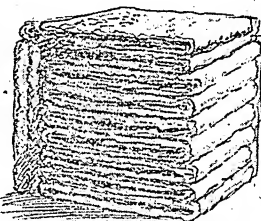
BRINGING IN THE LATEX



TAPPING



A COAGULATING TANK



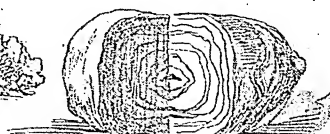
AMBER BLANKET CREPE



RED UPPER CONGO



PLANTATION TREE SCRAP



UP RIVER FINE PARA

THE RUBBER INDUSTRY

The illustrations appearing throughout this article show that rubber is obtained from trees. Through grooves cut in the bark, a milky juice exudes. This is latex, in which the rubber particles are suspended. In the forests of Brazil, where the rubber trees grow wild, it was formerly customary to dip a paddle into a bucket of latex, and hold the stick over a smoldering fire until the latex evaporated and a film of rubber was left on the paddle. By repeated dippings, balls, or "biscuits," of rubber were obtained; these were shipped to foreign markets under the name Para rubber, because Para, in Brazil, was then the chief center of export.

In Africa, crude Congo rubber is obtained from climbing shrubs. Most of the rubber of commerce is now derived from cultivated rubber trees in Malaysia and the East Indies. On the great plantations of the Far East, the latex is poured into tanks, and the rubber is coagulated by the action of dilute acetic acid. The "coagulum," in the form of doughlike sheets, goes through various processes of kneading, washing and drying, after which the sheets, which look like crêpe paper, are shipped to foreign countries to be fashioned into thousands of useful articles.

A Few of Several Thousand Manufactured Rubber Products

Automobile Accessories

Inner tubes
Rubber cement
Steering-wheel rims
Tire casings
Tube-repair outfits

Clothing and Accessories

Aprons
Corsets
Dress shields
Elastic cord
Garters

Sporting Goods

Baseballs
Footballs

Golf balls

Tennis balls
Swimming floats

Footwear

Bath slippers
Boots

Gaiters

Heels

Insoles

Druggists' and Surgical

Goods

Bands

Bath sponges

Bulbs

Gloves

Hot-water bottles

Ice caps

Rubber stockings

Syringes

Tubing

Electrical Goods

Battery cases

Battery jars

Insulation for:

Cables

Telegraph wire

Telephone wire

Radio parts

Switchboard parts

Telephone transmitters

Mechanical Goods

Bearings

Billiard cushions

Floor covering

Gaskets

Hose for:

Air brakes

Fire apparatus

Oil

Sand-blast machinery

Sprinkler systems

Steam

Locomotive packing

Mats

Stair treads

Stoppers

Tank linings

Transmission belting

Typewriter keys

Typewriter platens

Valve discs

Washers

Wringer rolls

Miscellaneous

Aeroplane parts

Balloons

Chemists' apparatus

Combs

Dental plates

Divers' suits

Dolls

Erasers

Fountain pens

Handballs

Jar rings

Pipe stems

Rubber bands

Teething rings

Toilet articles

Traveling cases

Varnish

United States imports half of the whole production, and at least two thirds of the imports are derived from sources under British control.

In 1922, when a falling rubber market threatened the Far East rubber-growers with bankruptcy, the British adopted a system of restricting exports. Excess shipments were subjected to heavy, graded taxes. The effect of the restrictions was to keep the price of rubber high, and the system also stirred up agitation in the United States for the development of American-controlled plantations. The British were forced to abandon this plan in 1928, but in 1934, co-operation with other rubber-producing countries enabled the English to establish even more complete control of rubber prices. In 1926, a group of American rubber companies formed a co-operative plan for purchasing crude rubber in concert, instead of competitively. Leading manufacturers also bought large rubber plantations in Liberia and Brazil. In 1929, Thomas Edison made rubber from goldenrod, but at prohibitive expense.

Consideration has been given to growing rubber in America or its colonial possessions. The most favorable outlook is for cultivating guayule in California and other parts of the southwest. (See GUAYULE RUBBER.) Another important plant is *Cryptostegia grandiflora*, native to Mexico but also grown in the West Indies and southwestern United States. In 1942, on farms in New Jersey and other northern states, American rubber companies began raising the kok-saghyz dandelion, from whose latex Russia derives most of its natural rubber.

Synthetic Rubber. Although American chemists had experimented with and produced synthetic rubber or elastomers for many years, the necessity for such substitutes did not arise until Japanese aggressions in the Far East during World War II (which see) cut off 98 per cent of the United States natural rubber supply. Among the most important elastomers are *Neoprene*, *Butyl*, *Thiokol*, and *Buna*. *Neoprene*, an American discovery, is derived from chlorine and carbon. Products made from this material since 1931 include gasoline hose, chemists' gloves, special boots and overshoes, washers, gaskets, automobile tires, and cable insulation for oily pumps and machinery. *Thiokol* has similar uses. *Butyl*, prepared from *isobutylene* (a gas refinery by-product), can be used for inner tubes, gas bags for blimps, hot-water bottles, boots, and shoes. *Buna*, which German chemists began developing as early as 1927, is derived from *butadiene* (hydrogen and carbon). Germany used such domestic vegetable material as potatoes, straw, and grains. In addition to grains, American manufacturers used petroleum. The first all-synthetic tires were made in 1943 from butadiene, produced in the government plant at Institute, W. Va. Other plants were later established in Baton Rouge, Pitts-



Photo: Firestone

MAKING SYNTHETIC RUBBER

Synthetic rubber latex is poured into vats where it coagulates into solid crude rubber. It is then ready for manufacture into various products by the same process as that used for natural rubber.

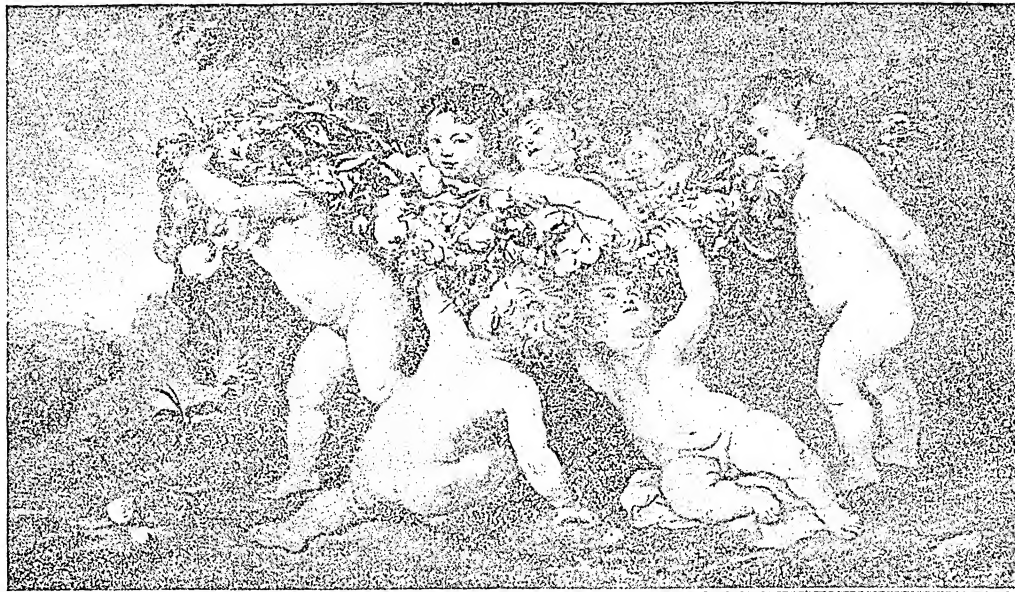
burgh, Louisville, and Los Angeles. G.M.S.

RUBBLE WALL, a wall of rough, irregular quarried stone. See illustration, page 1010.

RUBELLITE, *roo bel' ite*. See TOURMALINE.

RUBENS, *roo' benz*, PETER PAUL (1577-1640), the most celebrated painter of the Flemish school, was born at Siegen, a town of Westphalia, in Germany. Rubens stands preëminent as a master of composition, and ranks next after Titian and others of the Venetian school as a colorist. Not only was he distinguished as a painter of religious and mythological subjects, but he also excelled in portraiture, in landscape art, and as an animal painter. He portrayed the Flemish peasantry in many different guises, and painted portraits of the monarchs and distinguished men of the many countries which he visited as diplomat-painter. His charming personality, his courtly grace of manner, and his tact and intelligence made him a favorite with all classes, and he could converse in six different languages.

After the death of his father, when Peter Paul was ten years of age, his mother returned to her native Antwerp. The youth then began his art education under the leading masters of that city. In 1600 he went to Italy, entering the service of the Duke of Mantua, for whom he executed a number of paintings, and by whom he later was entrusted with a secret mission to Philip III of Spain. This mission introduced Rubens to a diplomatist's career, for which he was well fitted. While in the service of the Duke of Mantua, he found time



The Art of Rubens. Reproductions of the original paintings, *The Garland of Fruits* (now in Munich), and
 6232 *Diana Returning from the Hunt* (in the Dresden Gallery).



The Art of Rubens. Reproductions of *The Flight of Lot* (now in the Louvre, Paris), and *The Resurrection of Lazarus* (in the Kaiser Friedrich Museum, Berlin).

to become acquainted with Titian's masterpieces, and he also studied Paul Veronese and Michelangelo. Upon his return to Antwerp, in 1608, he was appointed court painter to the Archduke Albert, who built for him a magnifi-



Photo: Brown Bros.

PETER PAUL RUBENS

Reproduced from an old painting.

cent Italian mansion. In 1609 he painted his famous *Adoration of the Magi*, and between 1611 and 1614, his masterpiece, *The Descent from the Cross*, which hangs in the old Notre-Dame Cathedral of Antwerp. His fame then was established. Pupils flocked to his studio, and sovereigns and princes vied with one another to show him favor.

In 1622 Rubens was invited by Maria de' Medici, mother of Louis XIII of France, to paint for the gallery of the Luxembourg at Paris a series of allegorical pictures illustrating twenty-four scenes from her life. In 1628 he was sent on a diplomatic mission to Philip IV of Spain, and the following year was appointed envoy to Charles I of England to assist in private negotiations of a peace between Spain and England. For the success of his mission, he was knighted by Charles I. Philip IV conferred a similar honor upon him. While he was in these countries, his brush was not idle, for he painted portraits of these monarchs and their courtiers.

Having wearied of an ambassador's life, Rubens returned to Antwerp to enjoy his remaining years as a private citizen. Some of his best works belong to these later years, notably *The Holy Family of Saint George*, *The Cruci-*

fixion of Saint Peter, and *The Flight into Egypt*. So rapidly did Rubens work that he was known as "a perfect wizard with his brush." Sir Joshua Reynolds called him "the greatest master in the mechanical part of the art; the best workman with his tools that ever used a pencil." Brightness of coloring especially marks his later work, for Rubens was a great admirer of Titian. He left to posterity thousands of paintings covering a multiplicity of subjects, and died at the height of his fame.

The Metropolitan Museum in New York possesses, among other canvases, two of his finest examples of portraiture: *Anne of Austria* and *Cardinal Infant Ferdinand*.

RUBICON, ru' bih kon. In the year 49 B.C., while Julius Caesar was in command of the legions in Gaul, a decree was passed by the Senate ordering him to disband his army. In defiance of this command, he led a band of veterans across the boundary between Nearer Gaul and Italy—the Rubicon River—and marched into Rome. This was virtually a declaration of war against the republic, and was his first step toward gaining supreme power. Because of this event, the Rubicon has a permanent place in history, and the expression "to cross the Rubicon" has come to mean the first decisive step in a hazardous enterprise, from which there is no turning back. This ancient river of Central Italy was about twenty miles long, and emptied into the Adriatic. It formed the southern boundary of Caesar's province of Cisalpine Gaul. Historians are not agreed upon the identity of the Rubicon, but Italian studies completed in 1932 indicate that the present Fiumicino is the ancient Rubicon. See CAESAR, GAIUS JULIUS.

RUBIDIUM, roo bid' ih um. See CHEMISTRY (The Elements).

RUBINSTEIN, roo' bin stine, ANTON GREGOROVICH (1829-1894), a Russian musician who aspired to be a great composer, but attained lasting fame as a pianist. He was born at Wechwotynecz, Russia. His family was Jewish, but each member was baptized in the Greek Catholic Church in 1830, when Czar Nicholas threatened expulsion of all orthodox Hebrews. His mother and a Russian teacher named Alexander Villoing gave him practically all the musical training he ever received, although for a short time in 1840 he attended the Paris Conservatory. It was soon discovered that his musical intuition and technique were so great that the various teachers he met could add little to his knowledge of the art. Liszt and Chopin became his close friends and genuine admirers, and under their advice, he received some instruction in composition from great teachers in Berlin.

When Rubinstein was but sixteen years old, he began to teach in Vienna, and two years later went to Saint Petersburg (now Leningrad),

where, in spite of his Jewish blood, his playing aroused extraordinary enthusiasm. The Grand Duchess Helen became his patron, supplied him with money, and gave him frequent opportunities to be heard in public. There, in 1851, his first opera, *Dimitri Donskoi*, was presented successfully. He was later advised by his patroness to make a concert tour of the larger European cities, and in 1857 played in Hamburg, Leipzig, London, and other musical centers. His appearances in London were in the nature of triumphs, for few pianists had ever been able to stir all classes of citizens as he did.



Photo: Brown Bros.

RUBINSTEIN

In 1858 Rubinstein was appointed director of the Royal Russian Musical Society, and four years later founded the famous Conservatory of Saint Petersburg. His frequent concert tours throughout Europe made him by far the most famous pianist of his day, and when, in 1872 and 1873, he appeared in America, his reception was most unusual. Crowds followed him about the streets of the larger cities, the throngs at the theater doors fought for places in line, and audiences often arose and cheered when he had finished the playing of a composition. In 1889 the Russian government made him a nobleman.

His Place in Music. Rubinstein was a supreme master of piano-playing. In technique, in power of interpretation, in ability to execute the most difficult passages, he has never been surpassed. As a composer, he fell short of his highest aims. His operas lack dramatic power, and his pieces for the orchestra and piano fall short of sustained greatness, though they have many beautiful passages. Rubinstein's output was prodigious. His principal compositions include the *Ocean Symphony* and *Dramatic Symphony*; the operas *Nero* and *The Demon*; the oratorios *Paradise Lost* and *Christus*; and the piano compositions *Melody in F* and *Kaminoi Ostrow*.

RUBIO. ORTIZ. See MEXICO (History).

RUBLE, *roo' b'l*, a silver coin, formerly the Russian monetary unit, equivalent at par to 51½ cents in United States and Canadian money. It is divided into 100 kopecks. During the period following the Bolshevik revolution, when there was an unlimited issue of worthless paper money, the ruble had no settled value, but as conditions became more normal, values were, to a great extent, stabilized by a new issue based on gold. The currency now in circulation includes treasury notes in de-

nominations of 1, 3, and 5 gold rubles; bank silver (90 per cent silver and 10 per cent copper) in denominations of 1 ruble and 50 kopecks; change silver (50 per cent each of silver and copper) in denominations of 20, 15, and 10 kopecks; and copper coins in denominations of 1, 2, 3, and 5 kopecks. See MONEY (Values of Foreign Monetary Units).

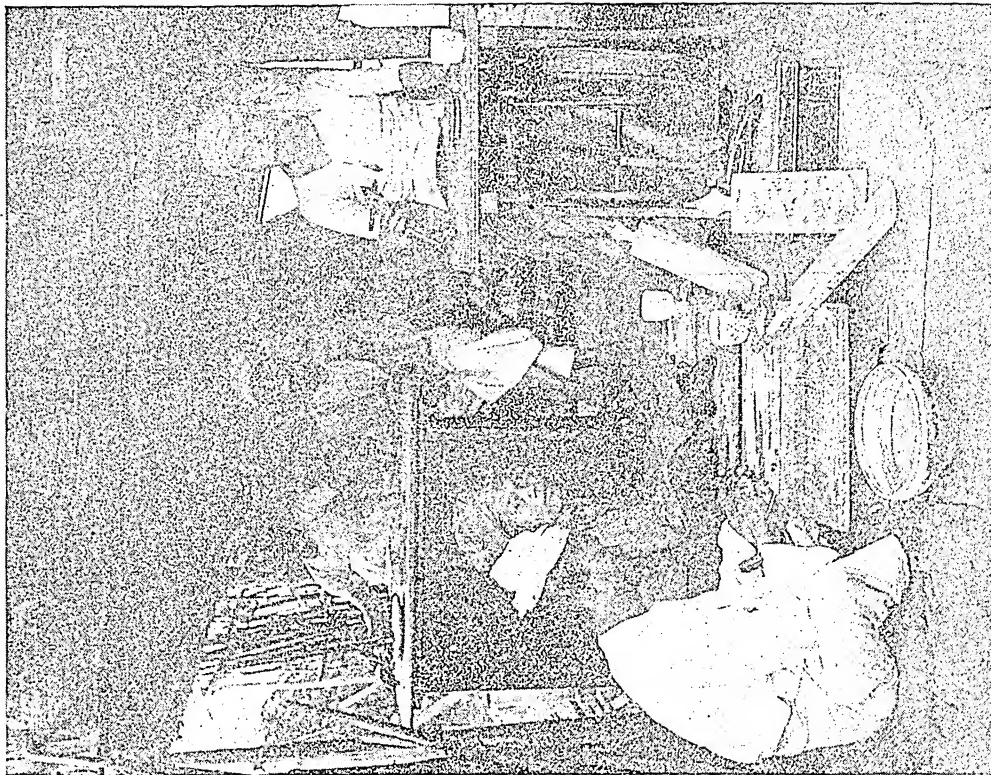
RUBY, a transparent variety of corundum, and the costliest of all precious stones. The sapphire is a variety of the same mineral, but of a blue color. The ruby occurs in various shades of red, from deep scarlet to pale rose, but the most valuable ruby is that having the color of a pigeon's blood. True, or *Oriental*, rubies are found chiefly in Burma, Ceylon, and Siam, but genuine stones of small size occur in Macon County, N. C., in stream gravels. Pigeon-blood stones come principally from Burma, pomegranate-red from Ceylon, and garnet-hued from Siam. An Oriental ruby of good color, free from flaws, is worth several times as much as a diamond of the same size, but it is not so hard as the latter. The ruby has a greater value, in proportion to size, than any other gem.

There are several red stones on the market to which the name ruby is applied, but which are not genuine rubies. Some of these are imitations in glass. The so-called *Cape*, *Australian*, and *Arizona rubies* are in reality fine garnets, and the *Siberian ruby* is red tourmaline. *Spinel rubies* are transparent red crystals of magnesium aluminate. Experts can readily distinguish genuine from spurious stones by tests as to hardness, specific gravity, etc. For the manufacture of artificial rubies, see GEMS; see, also, color plate in article.

According to the lore of precious stones, the ruby is the birthstone for July, and the symbol for the fortieth wedding anniversary. It is believed by the superstitious that to dream of rubies is a sign of unexpected guests. See CORUNDUM; DIAMOND; GARNET; GEMS; illustration, page 6236. T.B.J.

RUDDER, a part of a ship's steering mechanism. See SHIP; illustration, pp. 6564, 6566.

RUDE, FRANÇOIS (1784-1855), a French sculptor of highest rank, whose work is representative both of classic purity and of uncompromising realism. Among his finest achievements are *Mercury Fastening His Sandal*, *Neapolitan Fisher Boy*, and *Joan of Arc*, all of which are in the Louvre. His artistic power is also revealed in the superb monument of *Godefroy Cavagnac*, in Montmartre. He studied at the School of Fine Arts in Paris and later went to Rome. His *Mercury Fastening His Sandal* and the *Neapolitan Fisher Boy* were his first successes. *Le Départ* (*The Departure*) is considered to be his greatest production. It was executed for the Tri-



Ruby Production in Burma. At left, a ruby mine. At right, ruby cutting in a native shop; the tools are rude, but gems of remarkable beauty are cut. (See article on Rubys, page 6235.)

Photos: U & U

umphal Arch of the Star (see ARCH OF TRIUMPH), and represents the departure of the volunteers from Paris in 1792.

RUDOLPH, OR RUDOLF, LAKE, a long, narrow lake in equatorial Africa, 3,088 square miles in area, lying between Uganda and Kenya Colony and Protectorate, and touching the southern boundary of Ethiopia (Abyssinia). As it lies in a sterile region, it is of slight economic importance. Rudolph was discovered by white men in 1888.

RUDOLPH ISLAND, a small island in Fridtjof Nansen Land. In 1937, it was used as a base for the Russian expedition to the North Pole. See POLAR EXPLORATION; RUSSIA.

RUE, the French word for street. See PARIS.

RUFF, a species of sandpiper native to the eastern hemisphere. During the mating season, the adult male develops a tuft of feathers on his neck, which is capable of being swelled out into a ruff, variable in color, changing from black, chestnut, and reddish to buffy and whitish. He is also greatly disposed to fight at this season, boldly attacking intruders. The female is much more modest in plumage and in behavior, and is known as a *recce*. Occasional specimens of the ruff have been taken on the coast of Eastern North America. See SANDPIPER. D.L.

Scientific Name. The scientific name of the ruff is *Machetes*, or *Pavoncella, pugnax*.

RUFFED GROUSE. See GROUSE, subhead.

RUFFO, ru' fo, TITTA (1877-), an Italian baritone, who became world famous for his interpretation of dramatic and lyric rôles in grand opera. He was born at Pisa. At an early age, he entered the Conservatory of Santa Cecilia at Rome, ambitious to fit himself for an operatic career. After two years of study, he was told

to select another profession, as his voice was not deemed equal to the success he coveted. But the youth believed otherwise. He was

bent upon a musical career, and the criticism only made him the more determined, despite the fact that he was almost penniless and the choice of a profession could not be put off long. Undismayed, he went to Milan, where, under the instruction of Signor Cassini, he developed remarkable powers. Subsequently, he sang in the larger cities of South America, and then made a triumphant tour of his native land. He made his debut in the United States at the Metropolitan Opera House, New York,

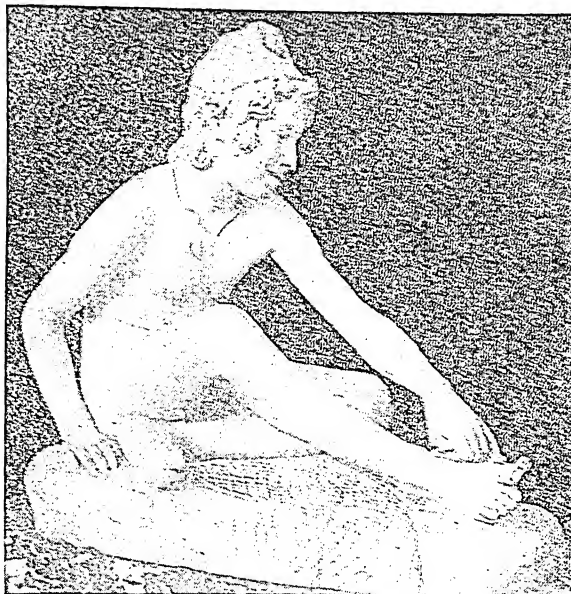
in 1912, and the same season achieved a sensational success in *Rigoletto* with the Chicago Grand Opera Company. Among other operas in which he gained high honors are *Pagliacci* and *Hamlet*. Ruffo also won popularity as a concert singer.

RUGBY, AMERICAN. See FOOTBALL.

RUGBY SCHOOL, one of the most celebrated of English public schools, was founded in 1567 at Rugby, England, through a bequest of Laurence Sheriffe, a grocer of Rugby and staunch supporter of Queen Elizabeth. The purpose of the founder was to establish a school for the boys of Rugby and the country adjacent to it. Because of litigation over the will, the school remained in obscurity during its first hundred years. In 1688 it had only 100 students, and for the next hundred years, the number did not increase. It first occupied the present site in 1750, but the oldest building existing to-day dates only from 1813.

In 1777 Thomas James of Eton was elected head master of Rugby.

He introduced the Eton system of small, separate houses for the pupils, instead of lodging them all in one large dormitory,



THE NEAPOLITAN FISHER BOY

An example of the art of Rude. The original is in the Louvre, Paris.



Photo: Brown Bros.

TITTA RUFFO

raised the standard of scholarship, and improved the discipline. In sixteen years he increased the number of students to 245. Under his successor, Wooll, further progress was made. During the latter's administration the playground or "close" was enlarged, and Rugby football was developed.

But Rugby owes its reputation chiefly to Thomas Arnold, who became head master in 1828 (see ARNOLD, THOMAS). When Arnold assumed his duties, English public schools had reached a crisis, and there was a growing desire for the state to assume control. Taking conditions at Rugby as he found them, Arnold wrought changes that within a few years extended to all the leading public schools of the country. He did not revolutionize the existing systems so much as he *humanized* them. He impressed his blameless life and strong personality upon every phase of the school's activities; he trusted the boys, and made the upper classmen responsible for their own conduct and that of the boys in the lower forms. He emphasized the value of a religious and moral life, and directed all the energies of the school to the building of character. His teaching and his sermons were an inspiration. Rugby soon became known from one end of England to the other, and to-day it is one of the most widely known schools in the world.

The town of Rugby is about eighty-two miles northwest of London. It is on the south bank of the Avon River.

Literary Reference. Rugby has become known to almost every schoolboy through *Tom Brown's School Days*, by Thomas Hughes, one of the school's most famous graduates.

RUGS. See CARPETS AND RUGS.

RUHR, *roor*, a river which winds through Westphalia, a division of Northwestern Germany, for 142 miles and joins the Rhine twelve miles west of Essen. The valley of the Ruhr has vast coal fields and is the center of iron and steel manufacturing.

Before World War I, the Ruhr Valley was the scene of incredible activity. Long trainloads of ore from Lorraine were rolled up to the foundries, dumped, and melted over the huge glowing furnaces. Black smoke and flames belched from the tall smokestacks. Busy men darted purposefully from one job to another. Shafts of coal mines dotted the countryside, and tons of coal were brought to the surface. The occupation was dangerous, but the wages were high and the miners prosperous and happy. From this industrial independence grew political independence. Proud Westphalians refused to be dominated by military rule, and even the Kaiser could not tyrannize over citizens who knew that their labors were developing the richest natural resources in Europe. Manufacture of

guns and ammunition kept the furnaces burning during the war.

At the Versailles Peace Conference, French statesmen, remembering the Franco-German war settlements, when Germany demanded a huge indemnity, insisted that Lorraine with its valuable ore deposits be given to France. French industrial magnates waited hopefully for the loss of Lorraine to affect the Ruhr. The loss of the ore deposits of Lorraine seemed to point to certain disaster for that industrial center. But the German ironmasters received compensation from the German government for the loss of the source of ore, and immediately invested the money in smelting works and furnaces adapted to Swedish ores. France became alarmed over a situation which left them with an unlimited supply of ore, with no outlet for it.

The French government, at a meeting of the Reparations Commission (December, 1922-January, 1923), declared that a default in certain payments by Germany gave France the right to occupy the Rhineland. On January 11, French and Belgian troops marched into the Ruhr Valley. Dour citizens watched the foreign soldiers with cold hostility. An armed rule was not to be tolerated. Then began a system of passive resistance which lasted for eight months. The German government encouraged the attitude by supplying funds to the workers during enforced idleness, and indemnifying the business losses of merchants and manufacturers. When the sullen Germans, putting the maximum difficulties in the way of the French, became openly hostile and committed acts of violence, the government wrote notes of deprecation to France, but took no action in the Ruhr. The French did not accept the passive resistance meekly. German men, women, and children were deported at a few hours' notice, and the perpetrators of acts of violence were court-martialed and sent to prison, where conditions were unsanitary and the treatment of prisoners was often brutal.

This unfortunate state of affairs was finally ended on September 27, 1923, when orders came from Berlin to cease passive resistance and establish martial law. It was the hopeless state of German finance which changed the policy in the Ruhr. The occupation had cost Germany 3,500,000,000 gold marks, and the great industrialists demanded an indemnity of 706,402,500 gold marks. France had lost about \$200,000,000 worth of coal, and the total loss to the world cannot be estimated. By 1924 France realized that the occupation had failed. French troops were accordingly withdrawn before August 15, 1925, under terms of the Dawes Plan (which see). During World War II, British and Allied planes bombed chemical plants in Wuppertal, munitions factories in Es-

sen, and iron works in Dortmund, besides breaching the Moehne and Eder dams. See GERMANY.

RUISDAEL, *rois' dahl*, JACOB. See RUYS-DAEL, JACOB.

RULE OF THREE. See PROPORTION.

RULERS OF ENGLAND. See page 2257.

RULERS OF FRANCE. See page 2582.

RULERS OF THE WORLD. In the table below are listed the names of the rulers of the world.

COUNTRY	CAPITAL	RULER	ACCES- SION	TITLE
Afghanistan	Kabul	Mohammed Zahir Shah	1933	King
Albania	Tirana	Victor Emmanuel III	1939	King of the Albanians
Argentina	Buenos Aires	Pedro P. Ramírez	1943	President
Belgium	Brussels	Leopold III	1934	King of the Belgians
Bolivia	La Paz	Enrique Penaranda	1940	President
Brazil	Rio de Janeiro	Getulio Vargas; term six years	1930	President
Bulgaria	Sofia	Boris III	1918	Czar
Chile	Santiago	Don Juan Antonio Rios	1942	President
China	† Chungking	National Government Council		
Colombia	Bogotá	Alfonzo Lopez; term four years	1942	President
Costa Rica	San José	D. Rafael A. Calderón Guardia	1940	President
Cuba	Havana	Fulgencio Batista	1940	President
Denmark	Copenhagen	Christian X	1912	King
Ecuador	Quito	Carlos Arroyo del Río	1940	President
Egypt	Cairo	Farouk I	1936	King
Estonia***	Tallinn	Constantin Paets	1938	President
Ethiopia	Addis Ababa	Ras Tafari (Haile Selassie I)	1930	Emperor
Finland	Helsingfors	Risto Ryti	1940	President
France	Paris	Henri Philippe Pétain	1940	Chief of State
Germany	Berlin	Adolf Hitler	1934	Reichsfuehrer
Great Britain	London	George VI	1936	King
Greece	Athens	George II	1935	King
Guatemala	Guatemala	Jorge Ubico; term extended to 1949	1931	President
Haiti	Port-au-Prince	Élie Lescot	1941	President
Honduras	Tegucigalpa	Tiburcio Carias Andino, term extended, 1949	1933	President
Hungary	Budapest	Nicholas Horthy	1920	Regent
Iceland	Reykjavik	Sveinn Björnsson	1941	Regent
Iran (Persia)	Tehran	Mohammed Riza Pahlevi	1942	Shah
Iraq	Baghdad	Feisal II, under a regency	1939	King
Ireland (Eire)	Dublin	Douglas Hyde	1938	President
Italy	Rome	Victor Emmanuel III	1900	King
Japan	Tokyo	Hirohito	1926	Emperor
Latvia***	Riga	Karlis Ulmanis; acting president	1936	President
Liberia	Monrovia	Edwin Barclay; re-elected 1936	1932	President
Liechtenstein	Vaduz	Francis Joseph II	1938	Prince
Lithuania***	Kaunas	Antanas Smetona; re-elected 1938	1932	President
Luxemburg	Luxemburg	Charlotte	1919	Grand Duchess
Mexico	Mexico, D. F.	Manuel Avila Camacho	1940	President
Monaco	Monaco	Louis II	1922	Prince
Netherlands	The Hague	Wilhelmina	1898	Queen
Nicaragua	Managua	Anastasio Somoza; term extended eight years	1937	President
Norway	Oslo	Haakon VII	1905	King
Oman	Muscat	Said ibn Taimur	1932	Sultan
Panama	Panama	Adolfo de la Guardia	1941	President
Paraguay	Asunción	Higinio Morinigo	1940	Acting President
Peru	Lima	Manuel Prado y Ugarteche	1939	President
Poland	London**	Wladislaw Raczkiewicz	1939	President
Portugal	Lisbon	Antonio Carmona; re-elected 1942	1926	President
Rumania	Bucharest	Michael V	1940	King
Russia	Moscow	Council of People's Commissars		
Salvador	San Salvador	Maximiliano Martínez; term extended to 1945	1935	President
Santo Domingo (Dominican Republic)	Ciudad Trujillo	Rafael Leónidas Trujillo	1942	President
Saudi Arabia, Kingdom of	Mecca	Ibn Saud	1926	King
Siam (Thailand)	Bangkok	Ananda	1935	King
Spain	Madrid	Francisco Franco	1939	Premier
Sweden	Stockholm	Gustaf V	1907	King

†The seat of government was moved from Nanking prior to Japanese occupation in December, 1937.

**Government-in-Exile moved from Angers, France, after the German occupation in 1940.

***Entered the Soviet Union in July, 1940; occupied by Germany during its invasion of Russia in 1941.

COUNTRY	CAPITAL	RULER	ACCESSION	TITLE
Switzerland	Bern	Enrico Celio; term one year	1942	President
Turkey	Angora (Ankara)	Ismet Inonu	1938	President of the Republic
United States	Washington D. C.	Franklin D. Roosevelt; re-elected 1940	1933	President
Uruguay	Montevideo	Alfredo Baldomir	1938	President
Vatican City		Pius XII	1939	Pope
Venezuela	Caracas	Isaías Medina Angarita	1941	President
Yugoslavia*	Belgrade	Peter II	1934	King

*Occupied and divided by Axis forces in 1941.

RUM, a strong alcoholic drink, produced mainly from molasses. The liquor is made by the fermenting and distilling of molasses and the refuse from the manufacture of cane sugar. When first produced, rum is white and transparent, but is given a dark-brown color by the addition of caramel and by being stored in casks that have contained sherry. Its strength and flavor increase with age, and rum that has been stored for as long as ten years will bring

a higher price than almost any other form of alcoholic beverage. The finest quality is now produced in Jamaica, and takes its name from that island. It is an exceedingly strong liquor, containing sometimes as much as eighty-two per cent of alcohol, and should never be used except for medicinal purposes.

Derivation. The word is an abbreviation of *rum-booze*, *rum* being an Asiatic word for *good*, and *booze* a derivation of the German *bausen*, meaning to *guzzle*.



R The STORY of RUMANIA

RUMANIA, OR ROMANIA, a kingdom of Europe, situated in the southeastern part of the continent, in the northeastern corner of the Balkan Peninsula. The country gained its independence from Turkey after the Russo-Turkish War of 1877-1878, in which Rumania took part as an ally of Russia. By taking sides with the winners in the Second Balkan War and World War I, Rumania won large territories. Its area became larger than that of Great Britain and Northern Ireland, and its population twice as great as that of Sweden and Norway combined. The kingdom was forced to return a large part of these new territories to their former owners in 1940, with the result that it is now only slightly larger than North Dakota

and its population approximates that of New York State.

Rumania occupies a very important geographical position, both from a strategic and a commercial point of view. It lies on the oldest overland European trade route connecting the Baltic with the Black Sea. It offers the easiest entrance into the Balkan Peninsula and to Istanbul from the north, and it contains the mouth of the Danube, which is the most important artery of communication and commerce in Central Europe. Thus it controls the shortest water route between Central Europe and Asia. Moreover, the extensive plain of the Danube constitutes the natural highway between Central Europe and the whole Black Sea and

the important eastern Mediterranean region.

Size and Location. As a result of World War I, Rumania increased in size from 53,489 square miles to 113,884 square miles through the annexation of Transylvania and the Banat from Hungary, Bucovina from Austria, and Bessarabia from Russia. The population was estimated at 19,933,802 on July 1, 1939. By the territorial cessions made in 1940 (see *History*), the area was reduced to 74,214 square miles and the population to about 13,291,000 (1941). Rumania is bounded on the north by Hungary and Russia, on the east by Russia and the Black Sea, on the south by Bulgaria, and on the west by Yugoslavia and Hungary.

The People. Before the outbreak of World War I, in 1914, Rumania had a population of 7,508,000. There were in the country small minority groups of Hungarians, Turks, Bulgarians, nomad gypsies, and Jews. There were also over 7,000,000 Rumanians living in neighboring countries. Most of these Rumanians were brought under Rumanian rule by the territorial changes after World War I. At the same time the minority groups in Rumania also increased in size. The 1930 census showed 12,980,000 Rumanians (72 per cent of the total population) as compared with 1,426,178 Hungarians, 740,169 Germans, 725,318 Jews, 577,693 Ruthenians, 415,217 Russians, and 361,058 Bulgarians. This situation was again changed in the territorial losses of 1940. Of nearly 6,500,000 Rumanians subject transferred to the neighboring countries, almost half were of Rumanian blood, while the rest were mainly Hungarians, Ruthenians (Ukrainians), Russians, and Bulgarians. Only relatively small groups of non-Rumanian peoples remained within the frontiers of the shrunken kingdom. The largest minority left were the Jews, and efforts were made to drive as many as possible out of the country.

The Rumanians belong to the Latin race and speak Rumanian, which is a Romance language, that is, one derived from the Latin. Of all the Romance languages, it is most like the Italian. Over eight tenths of the people are peasants, and their chief occupation is agriculture.

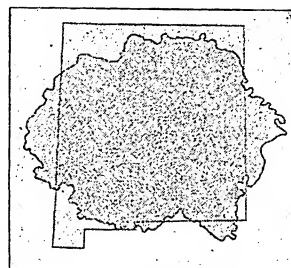
Principal Cities. Bucharest (in Rumanian, București), the capital city, is treated in a separate article in its alphabetical order. In 1939 Rumania had five other cities with a population of more than 100,000. Three of the most important of these—Cernăuți, Cluj, and Chisinău—were transferred to Russia and Hungary in the territorial cessions of 1940. These three cities, which the Rumanians hope to regain at the first opportunity, are described below:

Cernăuți, cher' nah oot zie, formerly Czernowitz, cher' no vits, former capital of the former Austrian province of Bucovina, near the River Pruth, is a town of commercial importance, with manufactories of

machinery, oil, and lumber, and many breweries. The population is mixed, consisting of Rumanians, Germans, Ruthenians, Poles, and Jews. The city is a railroad center, where most of the products of Bucovina were formerly shipped to markets in Rumania and Germany. It possesses many handsome buildings and a university. The city passed from Austrian to Rumanian possession in 1919 and was annexed to the Soviet Union on July 1, 1940. Population, 109,698 (1939 estimate).

Cluj, kloozh, formerly Klausenburg, *klow' zenboor K*, capital of Transylvania, was annexed by Rumania from Hungary in 1919 and returned to Hungary in 1940. It is a fairly important industrial, cultural, and trading center. There is a university and other important educational institutions. Population, of which the greater part is Rumanian, 100,272 (1939 estimate).

Chisinău, ke she na oo, formerly Kishinew, *ke she-nyawf*, the center and capital of the agricultural province of Bessarabia, which was occupied by Soviet troops in 1940. The city lies on the Bacu River, a tributary of the Dniester, and on a railway connecting the Black Sea port of Odessa, Russia, with Iași in Rumania. Commercial center of a rich agricultural region, it is known for its production of tobacco, tallow, flour, grain, wool, soap, and vegetable oils. The inhabitants are mainly Rumanians and Jews. Population, 112,500 (1939 estimate).



COMPARATIVE AREAS

Rumania, before 1940, 122,282 square miles; New Mexico, 122,634 square miles.

The most important cities of the present Rumanian kingdom are:

Iași, yah' shee, the ancient capital of Moldavia, which became the capital of Rumania for a short time after the Germans occupied Bucharest in 1916. It declined commercially after World War I, as its trade was diverted to the capitals of the new provinces of Bessarabia and Bucovina. But its importance revived when these provinces were lost in 1940. The city possesses a university, military school, conservatory of music and dramatic art, national theater, and various colleges and other cultural institutions. Population, 104,471 (1939 estimate).

Galati, gah lats, situated on the north bank of the Danube between the Prut and Siret rivers. It is an important river port and a commercial, railway, and military center. Before the development of Constanta, it handled most of Rumania's overseas trade. Its industries produce flour, petroleum products, wire, nails, soap, candles, and wood products. Population, 102,232 (1939 estimate).

Constanta, kon stan zah, Rumania's only seaport, through which flows a large proportion of its waterborne foreign trade. Since World War I, the harbor has been thoroughly modernized to handle the largest ocean-going vessels. Pipelines from the Rumanian oil fields bring their product directly to Constanta, where there are large oil storage facilities. Near the city are Mamaia and Eforia, two of Rumania's most fashionable summer resorts; also the famous mud

baths of Tekir-Ghiol. There are rail connections with Bucharest and the principal cities of the Danube basin. Population, 61,412 (1939 estimate).

Historic Provinces. The provinces of Transylvania, Bessarabia, and Bucovina, which Rumania annexed after World War I, lost in large part in 1940, are strategically important. Bessarabia and Bucovina were regained during the German invasion of Russia in 1941.

Transylvania comprises the fertile plateau region lying west and north of the natural barrier formed by the southern sector of the Carpathian range and its extension, the Transylvanian Alps. It produces abundant crops of cereals, flax, and tobacco, and is rich in mineral resources. Transylvania formed part of the province of Dacia, conquered and colonized by the Romans in the first century of the Christian Era. In 1003 it was incorporated into the domains of King Stephen of Hungary. The Turks conquered Transylvania in 1526, only to yield it to Austria in 1683. It came under Hungarian rule again in 1867, with the establishment of the Dual Monarchy of Austria-Hungary. At the end of World War I, the Rumanian majority revolted and their decision to join Rumania was confirmed by the Paris Peace Conference in 1919. The northern half of the province was returned to Hungary by an "arbitral award" by Germany and Italy on August 30, 1940, denounced by Rumania in 1941. Before this partition, the area of Transylvania was 24,020 square miles and the population was 3,414,492 (1937). At the 1930 census Rumanians comprised 57.6 per cent of the population, Hungarians 29.1 per cent, Germans 7.9 per cent, Jews 2.4 per cent. According to Rumanian estimates, the area ceded to Hungary in 1940 was 19,300 square miles with a population of 2,385,987, of whom at least 1,154,000 were Rumanians and 967,000 Hungarians. The bulk of the German minority, estimated at 536,311, remained in Rumania.

Bessarabia takes in the region bounded by the Dniester, Prut and lower Danube rivers. For a brief period between 1856 and 1878 its southwestern districts formed part of Moldavia, which joined with Wallachia in 1878 to form the kingdom of Rumania. From 1812 to 1918 it was part of the Russian empire. During the revolutionary upheaval in Russia, the Rumanian majority in the province sought union with Rumania and this was accomplished with the aid of

the Rumanian army and the consent of the Allied powers late in 1918. The Soviet Government seized the opportunity presented by World War II to re-occupy Bessarabia on July 1, 1940, but was driven out in 1941, during the German invasion of Russia. It is predominantly agricultural and under both rules the peasants were considered among the poorest and most backward in Europe. The area of Bessarabia is 17,146 square miles. The population (1939) was 3,200,000, of whom nearly 56 per cent were Rumanians, about 25 per cent Ukrainians and Russians, and the remainder Jews, Bulgarians, and Germans.

Bucovina, a principality of Moldavia during the period of Turkish rule, was ceded by Turkey to Austria in 1777 and incorporated into Rumania in 1919. It has an area of 4,030 square miles and a population (1937) of 910,997. Russia annexed the northern part of the province in 1940, but lost it during the German invasion in 1941. Northern Bucovina, as the region transferred to Russia is called, comprises 1,737 square miles of territory with a population estimated (1939) at 500,000. Ukrainians and Russians combined outnumber the Rumanians in this district. Farming, cattle raising, and lumbering are the chief industries.

Dobruja, another controversial area, lies south of the Danube along the Black Sea coast. Rumania obtained control of the northern section of this province from Turkey in 1878. It annexed the adjoining region of Southern Dobruja (3,320 square miles with 353,000 inhabitants, most of them Bulgarians) from Bulgaria after the Second Balkan War of 1913. The Rumanian Dobruja thus increased in area to 8,979 square miles, with a population (1939) of 906,588. On September 7, 1940, Rumania agreed to restore to Bulgaria 2,982 square miles of territory in Southern Dobruja with 378,314 inhabitants, virtually all Bulgarians except for some 77,728 Rumanians. The Bulgarians remaining within Rumania's new boundaries numbered only 91,476.

Physical Features. The Carpathian Mountains and their prolongation, The Transylvanian Alps, form the most striking physical feature of the country. They contain a number of rugged peaks 8,000 feet high. These mountains are usually covered with dense forests of fir and pine. Spurs of the Carpathians extend into the country for short distances, and then the ground slopes gradually through a series of

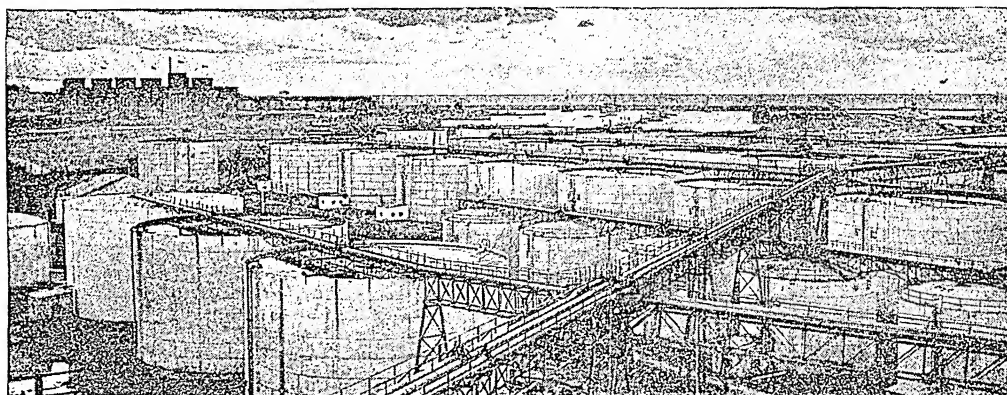
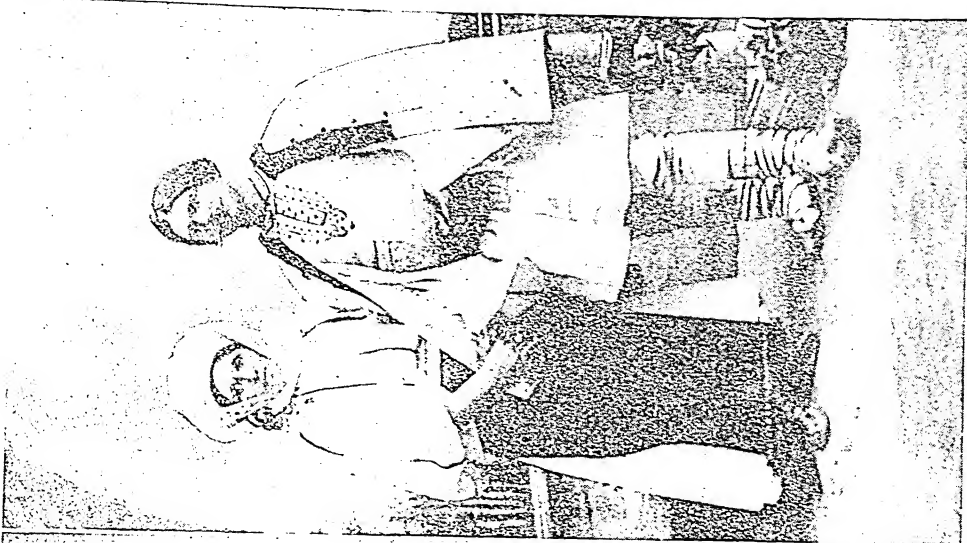


Photo: Rumanian Legation

OIL TANKS AT CONSTANTA, RUMANIA'S PORT ON THE BLACK SEA



Present-Day Scenes. At left, a typical peasant home. Straw coverings are yet used on roofs; the dress of the people is little changed from that of their ancestors centuries ago. At right, Sabbath costumes of Rumanian peasants.

Photo: U & U: O 1000

hills to the extensive level plains of the Danube. Rumania is well-watered by several rivers which run southward and flow into the Danube.

Climate. The climate is healthful, but it is subject to great extremes of temperature. The winters are bitterly cold, especially in the Old Kingdom, the plains being swept by cold winds blowing from the steppes of Russia. In Transylvania and Banat the winters are milder, owing to the Carpathian Mountains which form a protective curtain against the eastern winds. The whole country is covered by a thick mantle of snow for several months. The summers are very hot, the thermometer rising sometimes to over 100°F. in the shade. Spring lasts only a few weeks, but autumn is long and forms the most delightful season of the year. The rainfall is usually abundant.

Agriculture. Corn, which forms the staple food of the rural population, is the chief crop; next in importance comes wheat. Although millions of bushels of corn and wheat are raised annually, the production could be greatly increased if modern methods on a more extensive scale were used. Before the agrarian reform (see below), which followed World War I, half of the arable land was owned by less than 1 per cent of the population, but now the large estates have been split up, and a large percentage of the peasants have their own land. In the first years after the land was distributed to the peasants, their inexperience and inefficiency in management, coupled with lack of capital for exploitation, was made evident in the large reduction in the output of wheat and other cereals. There has been some improvement in agricultural methods since, but the standard of living of the peasants is still extremely low. Most of them continue to use the inefficient wooden plows of their ancestors and more than one third of the peasant families do not even possess draft animals. Moreover their educational opportunities are so restricted that many peasants are incapable of using modern machinery and methods. The average crop yield per acre on Rumanian farms is only about half as high as in Germany. Since the beginning of the world economic depression in 1929, the prices received for the peasants' produce have been so low that they have little cash to buy fertilizer, equipment, and other things that cannot be produced on the farm. For years the peasants have been forced to borrow at very high rates of interest; most of them struggle continually under a heavy burden of debt.

Besides corn and wheat, Rumania produces oats, barley, rye, grapes, and all kinds of fruit. The large plum crop is used mostly for distilling a special alcoholic beverage, called *tuica*, which is the national drink. Numerous horses, cattle, sheep, and swine are raised. The forests are another important source of national wealth.

Oak, beach, pine, fir, elm, willow, and walnut are the principal trees.

Minerals. Rumania is rich in mineral resources. One of the world's most productive oil zones has been developed since the beginning of this century in the foothills of the Transylvanian Alps in the vicinity of Ploesti and Buzau, from where pipelines carry the oil to Constanta and to Giurgiu on the Danube. These oil fields were one of the chief reasons for the establishment of a German protectorate over Rumania in 1940 and 1941. Production has declined in recent years—from 8,703,000 metric tons in 1936 to 6,239,000 in 1939. Rumania now ranks sixth among the oil-producing countries of the world; in 1936 it was the fourth largest. In 1941 almost the entire petroleum output went to Germany to supply its military machines. The Rumanian Government in 1940 expropriated the wells and equipment of British and American oil companies and placed the properties under German supervision.

The territorial cessions of 1940 did not affect the principal Rumanian mineral resources. Besides the oil zone, Rumania retained the important natural gas deposits of the Medias region, and the coal and iron resources of the Banat and Hunedoara. In the foothills of the Carpathians are found some of the largest rock salt deposits in the world. The mining of rock salt has been a government monopoly since 1863. Some of the salt mines are worked by convicts serving long sentences.

Commerce and Industry. Before World War I, Rumania's principal manufacturing industries were flour milling, brewing, distilling, tanning and oil refining. With the addition of new territories in 1919, Rumania acquired other industries, especially the large mining, metallurgical, and machine-building center at Resita in the Banat. Manufacturing expanded rapidly during the next two decades as a result of a larger national market, and a high protective tariff and other government aid, supplied largely at the expense of the peasants. The greatest progress was made in the manufacturing industries obtaining their raw materials from Rumanian farms and forests, and in the production of such elementary necessities as textiles, shoes, soap, and simple drugs. However a long list of more complicated articles, such as airplane motors, locomotives, and heavy machinery were manufactured also. Although many of these factories, including those of the Resita metallurgical center, remained in Rumania after the 1940 territorial losses, the outlook for manufacturing industries was not bright. Partitioned Rumania offered a much smaller market for their products. Moreover economic treaties concluded with Germany in 1939 and 1940 provided for the expansion of Rumanian agriculture, mining, and forestry,

and the exchange of its farm, mine, and forest products for German manufactured goods.

Rumania's chief exports, in order of importance, are petroleum products, cereals, wood products, and live animals. The principal imports are iron and steel products, textiles and textile materials, machinery, nonferrous metals, and chemicals. Before World War II, Rumania carried on a considerable trade with Great Britain, France, Italy, and the United States, but beginning in 1940 Rumania's foreign commerce was restricted almost entirely to Germany and the Central European countries.

The Danube River serves as an important artery of trade and most of the navigation service is state-owned and operated. As the Danube is international, boats of all nations living on its borders ply their trade, bringing goods from the higher reaches of the river to be loaded on the ocean-going vessels which cannot navigate farther than Braila and Galati, its two chief Rumanian ports. For about three months of each year the Danube is either frozen or in danger of being frozen, and during that period, railroads must be relied upon for communication. The network of railways and highways constructed during the period 1919-1940 to link newly acquired territories with the old kingdom of Rumania was largely disrupted by the partition of 1940, especially in Transylvania. For example, the Szekeley farming region was transferred to Hungary while its customary market, the city of Brasov, was left in Rumania. However the three main railway lines connecting Bucharest with Berlin via Lwów, Soviet Poland, and Budapest, Hungary, remained intact within Rumania. The Germans in 1941 were actively improving these railway systems and river transportation on the Danube to speed the shipment of oil and other Rumanian products to the Reich. They also undertook the construction in Rumania of new communication facilities for strategical purposes. The Rumanian railways and a shipping service operating on the Danube and the Black Sea are owned and operated by the state. Air lines link Bucharest and the other leading cities with most of the capitals of Europe.

Religion and Education. The majority of the people profess the Rumanian Orthodox faith, which is recognized as the state religion. The numerous minority religious groups—mainly Jews, Greek Catholics, Roman Catholics, Protestants, and Moslems—enjoyed full religious freedom until the introduction of a totalitarian dictatorship, beginning in 1939. Thereafter increasing restrictions were placed upon the religious as well as the political minority rights.

While elementary education is free and nominally compulsory, illiteracy is widespread among the peasants. Considerable progress was made during the years 1919-1939 in extending educational facilities, but the partition of the

kingdom in 1940 and subsequent political chaos tended to nullify these gains. There are commercial and agricultural academies at Bucharest; polytechnic institutes at Bucharest, Iași, and Timișoara; two architectural schools at Bucharest; music academies at Bucharest and Iași; a number of theological seminaries; and two universities—at Bucharest and Iași.

Government. Rumania is a monarchy, the throne being hereditary in the male line of descent. The constitution of 1923 liberalized the original constitution of 1866. It provided for universal suffrage for the election of deputies and senators, partial representation of minority groups, and the extension of full rights of citizenship to Jews. By the constitution of February 27, 1938, King Carol assumed dictatorial powers, responsible parliamentary government was abolished, and all candidates for public office and voters were required to be members of the only authorized political party, known as the Rumanian Renaissance Front. Rumania was a corporate state resembling Portugal.

Following the collapse of France in 1940, Rumania was transformed by successive steps into a totalitarian military dictatorship, modeled on that of Germany. On June 22, 1940, the King dissolved the Rumanian Renaissance Front and established a single new totalitarian "Party of the Nation," with himself as its supreme chief. On September 5 another royal decree dissolved Parliament, suspended the constitution of 1938, and placed most of King Carol's dictatorial powers in the hands of Ion Antonescu, who was appointed Premier. The following day Carol II abdicated in favor of his son, Mihai (Michael) V. Premier Antonescu continued to exercise virtually all of the governing powers. On September 14 he decreed the establishment of a state based upon the Nazi principles of the Rumanian Iron Guard organization. The Iron Guard became the dominant force behind the dictatorship, but on December 11, 1940, this control was shifted to the army.

History. The territory included in old Rumania was occupied in ancient times by a people called Dacians. The Roman Emperor Trajan conquered the whole region (101-106 A.D.) and brought here many Roman colonists. Known as Dacia, it was the first Roman province to feel the shock of the barbarian invasions. From the third until the end of the tenth century, this region was invaded by various barbaric peoples, who swept from Eastern Europe toward the southern and central parts. Finally, in the thirteenth century, the two independent principalities of Wallachia (or Muntenia) and Moldavia were constituted. After the Turks conquered the Balkan Peninsula, in the fourteenth century, these two principalities became autonomous provinces. Michael the Brave of Wallachia ruled the Rumanians as an

independent monarch at the close of the sixteenth century—but only for a short time. In 1601, he was assassinated in his military camp at Turda, in Transylvania.

Turkey dominated the principalities in the seventeenth century, although no Turks were allowed to settle on Rumanian soil. During the first decade of the next century, they attempted to free themselves, but Peter the Great of Russia aided the Turks in putting down the uprisings. Rumania was the battle-

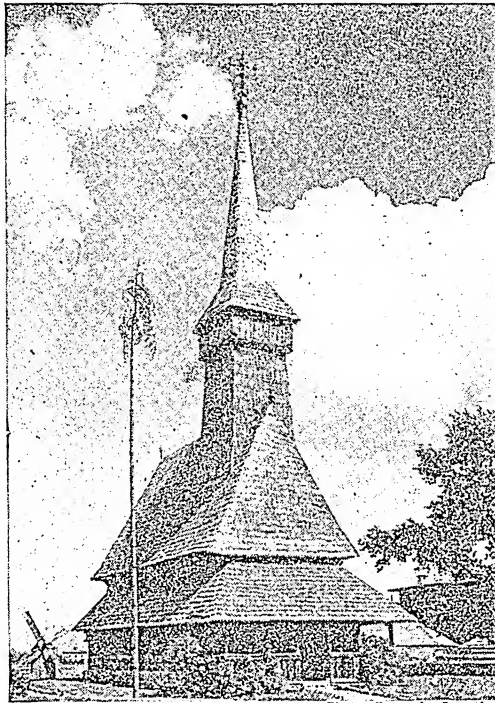


Photo: Rumanian Legation

VILLAGE MUSEUM IN BUCHAREST

field for the wars that followed between Russia and Turkey. In 1777 Bucovina was annexed to Austria, and in 1812, Russia took Bessarabia. Three southern districts of the latter province were restored to Rumania after the Crimean War (1856).

During the nineteenth century, Russia acquired a right to a protectorate over both Wallachia and Moldavia. But the national spirit began to awaken and the desire for the union of both provinces and their independence became very strong. The Congress of Paris of 1856 put the principalities under the joint protection of the Great Powers. In 1859, Moldavia and Wallachia elected as their ruler the same prince—Alexander Cuza—and thus became united under the name of Rumania. In 1866, Prince Cuza was deposed, and Prince Carol of Hohenzollern was called to the throne under a modern constitution; a German prince was chosen king because such a selection would

put an end to the quarrelsome ambitions of Rumanian aspirants. The country remained under the nominal suzerainty of the Sultan of Turkey until 1877, when the Russo-Turkish War broke out. Rumania then declared its independence and joined Russia in the War. The young Rumanian army played an important part in the capture of Plevna, which decided the outcome of the War. The Congress of Berlin (1878) formally recognized the independence of the country, and the portion lying south and east of the Danube, or the Dobruja, was acquired by Rumania for the southern part of Bessarabia, which was taken by Russia.

In 1881, Prince Carol proclaimed himself King, under the name of Carol I. He was succeeded in 1914 by his nephew, Ferdinand I, who chose a princess of the royal house of England for his consort. As Queen Marie, she became the best-known woman in European royalty, and proved herself one of the best politicians on the continent of Europe.

Rumania did not take part in the first Balkan War against Turkey, but helped Serbia and Greece to defeat Bulgaria in the Second Balkan War. By the Treaty of Bucharest (August 7, 1913), it obtained from Bulgaria a stretch of territory which amounted to 3,320 square miles, with a population of about 353,000.

World War I. In World War I, Rumania remained neutral at the beginning, although manifesting strong sympathies for the Allies. In the hope of gaining the provinces of Transylvania, Bucovina, and Banat, and liberating their oppressed kinsmen from the rule of Austria-Hungary, the Rumanians finally entered the war on the side of the Allies; war was declared against Austria-Hungary on August 27, 1916. Soon afterwards the Rumanian armies invaded Transylvania in order to relieve the pressure on the French front, by diverting part of the German army to the new battlefield. The Central Powers then launched a strong offensive, and after a campaign lasting about three months, the country was overrun, and more than half, including Dobruja, was occupied by the enemy. The setback of the Rumanian campaign was in no small measure due to the fact that the prearranged simultaneous attack by French and English troops massed at Salonica against the Bulgarians did not materialize, and also to the perfunctory and belated help sent by Russia. After the fall of Bucharest (December 6), the seat of the government was moved to Iasi. Rumania was forced by the collapse of Russia to sign the humiliating Peace of Bucharest in May, 1918. Two months later, however, Rumania reopened the campaign and the defeat of the Central Powers, later in the year, brought about the liberation of the entire country. At the Peace Conference, Rumania vigorously pressed its

territorial claims to Transylvania, Bucovina, and Bessarabia, in each of which the Rumanians formed the majority of the other ethnographical elements of the population. By special vote each province, exercising the right of self-determination, declared its willingness to be united with Rumania.

Postwar Period. Prewar Rumania was a country of *latifundia*, dominated by a numerically unimportant but politically strong class of big land and property owners, ruling over a vast mass of landless and politically inarticulate peasantry. In World War I, the peasants played a dominant role, and they believed they were entitled to more respect, greater political control, and ownership of the land. In 1917, during the Russian revolution, King Ferdinand found it expedient to promise his peasant soldiers these reforms; in particular, that when the land was reconquered, it would be divided among the people. Accordingly, between 1919 and 1920, laws were passed by which lands were expropriated, and sold in small lots to the peasants. The belief is expressed by Rumanians acquainted with the situation that had this reform not been made, Bolshevism would have spread over Rumania. The result of this reform was that the percentage of small holdings has increased from 60 to 90 per cent and the proportion of large estates was reduced to just over 10 per cent from the 40 per cent before the passing of the Agricultural Reform Act.

King Ferdinand and Queen Marie were crowned with due ceremony on October 15, 1922; a new constitution, embodying the above reforms, was adopted for the entire United Kingdom of Rumania, and formally sanctioned by the King on March 28, 1923 (see provisions under subhead *Government*). Political unrest was prevalent in Rumania in the early part of the postwar period, and its source may be traced to the divergent policies of the dominant political parties—the Liberal and the National-Peasant. The latter, brought into existence by the agrarian reform, represented the economic and political interests of the mass of the Rumanian peasantry.

In 1926, Crown Prince Carol renounced his right to the throne owing to differences with Premier Ion Bratianu, and his son, Mihai (Michael) was designated as heir to the throne. On July 20, 1927, King Ferdinand died, and the crown fell to Mihai, then but five years old.

Ion Bratianu, Carol's bitterest enemy, died on November 24, 1927, and was succeeded as Premier by his brother, Vintila. In November, 1928, Vintila Bratianu was replaced by Juliu Maniu, National Peasant party leader, bringing to an end the control exercised over Rumania since 1881 by the powerful Bratianu family. In the subsequent national election, the National Peasants polled 78 per cent of the popular vote.

Against the opposition of the Liberals, but with the approval of the regency and the army, Carol returned to Bucharest on June 6, 1930. Parliament repealed the law barring his succession to the throne, and proclaimed him king. His return was sanctioned by the Maniu



Photo: Rumanian Legation

FORMER KING CAROL

government in the hope that his rule would help to unify Rumania and tide the country over growing difficulties at home and abroad. The world economic depression was inflicting severe hardship upon the peasant masses. Fanned by the economic crisis and by the corruption prevalent in both public and private life, Communist and Fascist propaganda was making headway. There was danger of an internal political crisis that would afford Russia an opportunity to regain Bessarabia.

Carol's efforts to curb these menacing trends were handicapped from the start by his failure to effect a reconciliation with Princess Helen of Greece, his divorced wife and mother of Crown Prince Mihai. Instead the King permitted the return to Bucharest of his Jewish companion, Magda Lupescu, who had accompanied him in exile and who now proceeded to wield a powerful influence in governmental affairs. This antagonized Premier Maniu and many other influential Rumanians as well as the anti-Semitic organizations. Carol lost further support by his persistent efforts to curtail the constitutional powers of Parliament

Outline and Questions on Rumania

I. Position

- (1) Boundaries
- (2) Importance of position

II. Size

- (1) 72,880 square miles
- (2) Population

III. Country and Its People

- (1) Physical features
- (2) Extremes of climate
- (3) Rainfall
- (4) The people
 - (a) Races
 - (b) Language
 - (c) Religion and education

IV. Resources and Industries

- (1) Agriculture
- (2) Forests
- (3) Minerals
- (4) Commerce and industry

V. Government and History

- (1) Constitutional monarchy
- (2) Legislative branch
- (3) Early history
- (4) Independence achieved
- (5) Balkan Wars
- (6) World War I
- (7) Postwar period
- (8) Abdication of the king

Questions

State three ways in which the geographic position of Rumania makes it important.

What is the chief crop?

What was the program of the new government?

By what name was this territory known to the Romans? What part did it play in Roman history?

What part did it play in World War I?

Trace the gain and loss of territory in Rumania throughout its history.

For what mineral resources is it famous?

What is the Iron Guard?

tution of 1923, and all parliamentary and capitalist institutions. Among its numerous political crimes was the assassination of Premier Ion Duca on December 29, 1933. In 1935 Codreanu converted his movement into a political party, and in 1937 he combined with the National Peasants to defeat the King's hand-picked National Liberal government.

Hoping to discredit the Iron Guard and its program, Carol then named as Premier Octavian Goga, leader of another small Fascist movement and a rival of Codreanu. Goga put into effect anti-Semitic legislation and other measures that caused acute economic dislocations and aroused much criticism. In February, 1938, the King dismissed Goga and proclaimed a new authoritarian constitution (see *Government*). The Patriarch of the Rumanian Orthodox Church became Premier, but Carol held the newly acquired dictatorial powers and used them to arrest Codreanu and thousands of his followers. In May, 1938, Codreanu and his ablest lieutenants were sentenced to long prison terms. On November 10, it was announced that they had been shot to death while trying to escape. The Iron Guard continued to thrive underground, however, and on September 21, 1939, assassinated Premier Armand Calinescu in another unsuccessful effort to seize power. In retaliation, Carol reportedly ordered the summary execution of some 2,000 Iron Guardists.

Meanwhile Rumania's international position was growing more and more dangerous. Hungary and Bulgaria won German and Italian support for their territorial claims upon Rumania, while Russia's attitude became more threatening. Carol mobilized his army, fortified the disputed frontiers at great expense, and played off the Axis and Allied powers against one another in an effort to keep Rumania neutral and intact. This effort failed with the collapse of France in June, 1940. On June 26 Russia demanded the immediate cession of Bessarabia and Northern Bucovina. Carol knew that if he resisted Russia, the Hungarians and Bulgarians would seize the opportunity to carve up his kingdom. Therefore he gave in and the Red Army occupied Bessarabia and Northern Bucovina on July 1.

Carol's Abdication. Fearing that Russia might overrun the entire country, the King on June 21 reorganized his government along Nazi lines and threw in his lot with Germany and Italy in order to secure their protection. As the price of their collaboration, Germany and Italy forced the new Gigurtu Government to cede half of Transylvania to Hungary on August 30 and to agree to the return to Bulgaria of Southern Dobruja, effective September 7 (see *Historic Provinces*). Germany, in turn, promised to guarantee Rumania's eastern frontiers against further Soviet aggression. The surrender of over one million Rumanians to Hun-

and the cabinet. Turning against the strongly democratic National Peasant party, the King, beginning in November, 1933, placed the government in the hands of a succession of leaders of the National Liberal party. They manipulated elections to create parliamentary majorities subservient to the King.

While successful in his struggle to curb the power of the National Peasants, Carol found his position increasingly threatened by the revolutionary Iron Guard movement, led by Corneliu Zelea Codreanu. Subsidized by the Hitler Government in Germany, and supported by powerful antidemocratic elements in Rumanian military and business circles, the Iron Guard sought the overthrow of the King, the consti-

garian rule aroused deep anger in Rumania against the King and the Axis powers. The Iron Guard seized this chance to topple Carol from his throne. They led violent demonstrations against the regime. This induced Carol, on the advice of German officials, to free the pro-German General Ion Antonescu from prison and to appoint him Premier with dictatorial powers (September 4). Antonescu was an extreme nationalist, hostile to the King and in high favor with the Iron Guard. At his insistence, Carol abdicated on September 6 and fled to Switzerland, leaving his eighteen-year-old son, Mihai (Michael), as the powerless ruler of the kingdom.

Premier Antonescu attempted to govern with the aid of the Iron Guard leader, Horia Sima, who became Vice Premier. But factionalism among the Guardists, their mounting resentment of German encroachments, and their demand for more revolutionary economic and political action led to growing disorders. To make matters worse, the most destructive earthquake in Rumania's history on November 9 and 10 did great damage to life and property.

To avenge the slaying of Codreanu in 1938, the anti-Sima faction of the Iron Guard on November 27 slaughtered sixty-four prominent Rumanians who had been imprisoned for their association with King Carol's regime. Civil war spread to the provinces, taking a toll of several hundred lives before the army restored order. This was followed in December by heavy German troop movements into Rumania and the transfer to the Rumanian army of many of the powers held by the Iron Guard government. On January 21, 1941, Sima and his adherents revolted against Premier Antonescu, but the uprising was crushed. Rumania joined Germany against Russia and reoccupied Bessarabia and Bucovina in July. However, the economic exploitation of Rumania by the Nazis and the loss of some 500,000 men on the Russian front led to considerable unrest. R.S.K.

Related Subjects. The reader is referred to:

Balkan Wars	Corn	Russo-Turkish
Bucharest	Danube	War
Carpathian Mountains	Greek Church	World War I, II

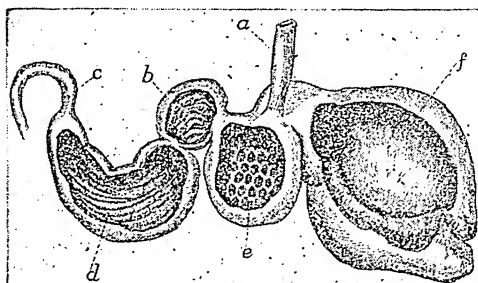
RUMELIA, *roo me' lih ah*, the name given by its Moslem conquerors to a region made up of ancient Thrace and a part of Macedonia. In 1878 the Treaty of Berlin made of it an autonomous Turkish province under the name of Eastern Rumelia. In 1885 Bulgaria and Eastern Rumelia united, but in the redivision caused by the Balkan Wars (1913), Rumelia was divided among Bulgaria, Yugoslavia, and Albania. See **TURKEY**.

RUMEN, *roo' men*. See **RUMINANTS**.

RUMINANTS, *roo' mih nants*, the name applied to grazing animals which chew the cud, and which are further characterized by their

split hoofs. They include camels, llamas, deer, sheep, goats, giraffes, pronghorns, antelopes, and cattle, all of which are described in these volumes. With the exception of the camel family, they have no incisor, or cutting, teeth in the upper jaw, the place being occupied by a callous gum, against which the lower incisors bite. The stomach is divided into four cavities. The mouthful of grass is mixed with saliva and swallowed into the first cavity, called the *rumen*, or *paunch*.

The food, unchanged, passes into the second cavity, the *reticulum*, which is sometimes called the *honeycomb bag* because of the pockets in its walls, which are arranged like honeycomb.



CROSS SECTION OF STOMACH OF RUMINANT

(a) Oesophagus; (b) psalterium; (c) duodenum; (d) abomasum; (e) reticulum; (f) rumen, or first stomach.

Here the food is packed into small masses called *cuds*, which latter, when the animal is resting, are propelled upward into the mouth, one at a time, by a muscular action similar to vomiting. These masses are slowly masticated by a kind of rotary motion of the jaws, called "chewing the cud." When sufficiently well masticated, the cud is swallowed, and this time it passes, not into the rumen, but along a muscular groove in the upper wall of the honeycomb bag, and enters the third division of the stomach, the *psalterium*. Thence it is carried on into the *abomasum*, where true stomach, or gastric, digestion takes place. Digestion is finally completed in the intestines, and the digested food is absorbed into the blood and lymph stream.

The ruminants are a division of that group of the animal kingdom known as *ungulates* (which see). W.N.H.

RUMP PARLIAMENT, in English history, the name given to the remnant of the Long Parliament which, in conjunction with Cromwell's army, brought about the condemnation of Charles I. On December 6, 1648, two regiments under the command of Colonel Pride entered the House of Commons, for the purpose of forcing its members to condemn the king. Ninety-six of the members were imprisoned or driven out, and only sixty of the more violent Independents were permitted to retain their seats. The clearance was called

Pride's Purge, and the sixty members, forming the *rump*, or fag-end, of the Parliament, were afterward known by the name of the Rump Parliament. When the Rump attempted to make a stand against certain demands of the army, in 1653, Cromwell filled the House with soldiers, pulled the Speaker out of the chair, cleared the room, and declared the Parliament to be dissolved. It was revived twice after this, but on March 16, 1660, it decreed its own dissolution.

Related Subjects. The reader is referred to the following articles in these volumes:

Charles (I, England)
Commonwealth of
England

Cromwell, Oliver
Long Parliament
Restoration

RUNES, *roonz*, the earliest written alphabet used by the Teutonic races of Europe. The name is from a Gothic word meaning *secret*, and is closely akin to the word for *magician*, thus showing that these characters were originally known only to a few, probably the heathen priests. Indeed, they were at first used exclusively in charms and incantations, though later inscriptions of all sorts, on monuments,

were in use tried to replace them with the Latin alphabet. The runes were retained in Scandinavia far longer than in any other region.

RUNJIT SINGH, *run jeel' sing*, more properly RANJIT SINGH (1780-1839), a noted ruler of the Punjab, India, and the only man who ever formed a confederacy of the Sikhs. was the son of a Sikh chieftain. His father died when Runjit was six years old, and the rule fell to his mother. When he was seventeen, Runjit rebelled against his mother, gained control of the government, and directed all his energies to founding a kingdom which should unite all the Sikh provinces. He was granted Lahore by the ameer of Afghanistan, and within a few years, subdued all the northern provinces. The chiefs of the provinces to the south asked for British protection, and in 1809 an agreement was reached whereby the Sutlej River became the southern boundary of Runjit's dominions. With the aid of Italian and French officers, Runjit then organized his army after European models and made a complete conquest of the Punjab, over which he assumed rule under the title of maharajah, or king of

f u th o r k (palat)g (gutt) w h n i j ch

p eo s t b e m l ng oe d æ ae y ea

ANGLO-SAXON RUNES

slabs, coins, jewelry, and willow wands used in incantations, were scratched in runic characters. The runes were made entirely of straight lines, and were arranged either singly or in combination.

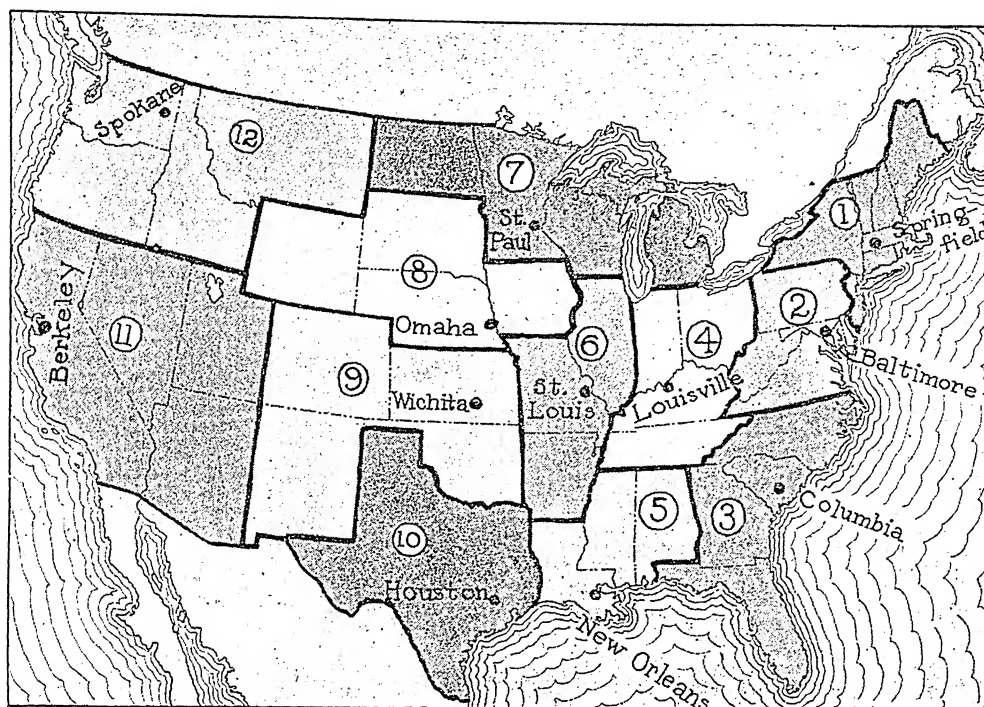
The oldest runic inscriptions found have dated back to the fourth or fifth century, but the origin of the runes is believed to be much earlier than that. The greater number of those discovered are earlier than the eleventh century. One of the most widely accepted theories is that the runic characters were copied from Greek and Roman coins, carried to Northern Europe by Greeks or Phoenicians. This may account for the two differing theories of origin, one of which attributes runes to the Roman alphabet, and the other exclusively to the Greek. Traces of their use are to be found in Germany, France, Spain, England, Denmark, Norway, and Sweden, but the three last-named countries have the largest number of runic monuments.

The Norsemen themselves ascribed the invention of the sacred characters to Odin, chief of the gods. Thus they were always identified with heathen worship, and the earliest Christian missionaries to the countries where they

kings. In 1836 he suffered a severe defeat by the Afghans, but continued to rule over the territory until his death. See AFGHANISTAN; SIKHS.

RUNNYMEDE, a meadow of interesting historical associations, because it was there, or near there, that the barons of England compelled King John to sign the Magna Charta, on June 15, 1215. Runnymede is thirty-six miles southwest of London, in Surrey, on the right bank of the Thames River. Whether the signing of the charter took place in the meadow or on an island near by is a matter of dispute. See **MAGNA CHARTA**.

RUPEE, *roo pe'*, a silver coin, the unit of value in the monetary system of British India. Such coins have been current since the middle of the sixteenth century, but they have varied largely in value. In 1832 the weight of the rupee, which is of silver, was fixed by the British at 180 grains, troy weight, of which 165 grains were to be pure silver, and this has remained the fixed standard to the present day. Of necessity, the value of the coin has fluctuated as silver has risen and depreciated in value. In 1899, to remedy this defect, the government fixed the value at one-fifteenth of



FEDERAL LAND BANK DISTRICTS

The city shown in each district is the location of a land bank and a farm loan board; these have jurisdiction over all rural credits in the district. (See RURAL CREDITS.)

a pound sterling (1 shilling, 4 pence), or about 32 cents of United States or Canadian money. In 1926 the Royal Commission on Indian Currency and Finance recommended the stabilization of the rupee at a rate corresponding to an exchange rate of 1 shilling, 6 pence (gold). The report was accepted by the government.

The rupee is in size between the United States quarter-dollar and half-dollar pieces. It bears on its obverse side the impression of the British sovereign; on its reverse, the words *One Rupee* and the date of coinage. For smaller coins, it is divided into 16 annas, and there are issued in silver 8-anna, 4-anna, and 2-anna pieces. The sum of 100,000 rupees is commonly spoken of as a *lakh* of rupees, while 10,000,000 rupees are a *crore*. Notes of the values of 5, 10, 100, 1000, and 10,000 rupees are legal tender throughout British India. See MONEY (Values of Foreign Monetary Units).

RUPERT'S LAND, a name formerly applied loosely to the Canadian Northwest, and more especially to the land surrounding Hudson Bay. This vast region, whose boundaries were only vaguely determined until the Dominion was organized, in 1867, was named in honor of Prince Rupert, the first governor of the Hudson's Bay Company. This territory was granted to the company by Charles II of England, and was surrendered by the company in 1869, when the title was transferred to Great

Britain. In 1870 it was formally transferred to the new Dominion of Canada. As a part of Canada, the Northwest was originally called "Rupert's Land and the North West Territories." See NORTHWEST TERRITORIES; ALBERTA.

RUPTURE. See HERNIA.

RURAL CREDITS. The rural community, in addition to the facilities provided by banks, mortgage companies, and individuals, has been afforded special credit facilities by the federal government. The needs for credit in farm communities may be divided into three classes: (1) short-term credits of less than nine months, (2) intermediate credits of from nine months to three years, and (3) long-term or mortgage credits extending from three to forty years.

Merchants, local banks, and production associations provide short-term credits. Loans not exceeding nine months which are made by member banks of the Federal Reserve system may be rediscounted at these institutions. The long-term credits have been furnished by commercial banks, insurance companies, mortgage companies, and private investors including retired farmers. Intermediate credits have until recently been considered too long for commercial banks and too short for investment banks. Livestock loan companies have filled a part of this gap by making range, breeder, stocker, and corn belt loans on cattle for periods

of from one to three years. The local banks have also financed the farmer by land mortgages. Special provision for long-term credits was made by the Federal Farm Loan Act of 1916. In 1923 Congress provided for intermediate credits, and in 1933 the entire system was again supplemented and partly reorganized.

The Federal Farm Loan Act of 1916 set up the Federal Farm Loan Board, the Federal Land Banks, and the Federal Joint Stock Land Banks. The Board was composed of the Secretary of the Treasury and seven members whose duties were to supervise the administration of credit. They were to charter national farm loan associations, supervise the banks, appoint four of the directors of each bank, regulate interest rates and bond issues, examine banks and associations, and publish reports.

The Agricultural Credits Act of March 4, 1923 set up the Federal Intermediate Credit Banks, and National Agricultural Credit Corporations, whose chief purpose was to furnish intermediate credits, under supervision of the Federal Farm Loan Board. The Farm Credit Act of 1933, however, prohibited the establishment of additional National Agricultural Credit Corporations. Also, the twelve Regional Agricultural Credit Corporations, which were created in 1932 by the Reconstruction Finance Corporation, were ordered liquidated wherever production credit associations could assume their duties. By 1942, only three such regional corporations were in operation.

The Farm Credit Act of 1933 likewise provided for the liquidation of the privately owned and managed Federal Joint Stock Land Banks. These made mortgage loans directly to farmers at the discretion of their boards of directors, and sold bonds to the investing public in order to obtain part of their funds. After their loans rose from approximately \$8,000,000 in 1918 to \$600,000,000 in 1929, the banks began to decline, some of them going into receivership.

Farm Credit Administration. The FCA, created by the Farm Credit Act of 1933 and further authorized and detailed by the acts of 1935 and 1937, assumed not only the duties previously performed by the Federal Farm Loan Board but many new functions. Its general purpose is to co-ordinate the system of credits in the twelve farm-credit districts established throughout the United States. The Administration is headed by a governor responsible to the Secretary of Agriculture. It has four major divisions: Federal Land Banks, Federal Intermediate Credit Banks, Production Credit Corporations and Associations, and Banks for Co-operatives, with a commissioner in charge of each division. In 1942, the FCA was placed under the Federal Deposit Insurance Corporation.

Federal Land Banks. In 1916, twelve Federal Land Banks were established, serving each

of the farm-credit districts. They make long-term, amortized loans to farmers on first-mortgage security, at low annual interest rates of 3.5 and 4 per cent. No loan may exceed 50 per cent of the appraised normal value of the farm, plus 20 per cent of the value of its permanent, insured improvements. To get such a loan, a farmer must apply to the National Farm Loan Association in the township where his farm is located. Each such association has no less than ten members, and its capital stock amounts to 2½ per cent of the amount borrowed. Loans range from \$100 to \$50,000.

The capital stock of the Federal Land Banks was originally subscribed by the Federal Government, and the resources were increased by selling farm-loan bonds to the public. As the condition of the bond market after 1929 made it impossible for these banks to function by selling bonds directly to investors, Congress directed the Treasury, through passage of the Emergency Farm Mortgage Act of 1933, to furnish them additional capital. The loans granted by the Federal Land Banks increased from approximately \$150,000,000 in 1918 to a peak of \$2,072,000,000 in 1936. By 1942, this amount had declined to \$1,700,000,000.

Federal Intermediate Credit Banks. These banks in the twelve farm-credit districts were organized in 1923 as supplemental agencies to the Federal Land Banks. They make loans to, and discount paper for, such financing institutions as state and national banks, production credit associations, livestock loan companies, and banks for co-operatives.

Production Credit Corporations and Associations. The Farm Credit Act of 1933 authorized the establishment of a Production Credit Corporation in each of the twelve cities where a Federal Land Bank has been established. These supervise, and partly capitalize, local production credit associations which farmers and stockmen have organized on a co-operative basis. They deal primarily with short-term loans amounting to \$50 and upwards, and bearing interest of 4.5 per cent per annum.

Banks for Co-operatives. Authorized by the Farm Credit Act of 1933, the Central Bank for Co-operatives in Kansas City, Mo., and the twelve district banks serve as a governmental source of credit for agricultural co-operatives. The interest rates range from 1.5 per cent to 3.5 per cent per annum on three classes of loans, an indirect benefit to farmers.

W.A.M.

RURAL EDUCATION, PROGRESS IN. No longer is the scope of rural education confined to the one-room or other very small school. Neither is it now assumed that rural education should train children and young people to live in a rural environment. It is recognized that, in a democratic society, the child born in the country has the right to seek his life work wherever it may be found, and

that the school system should, so far as possible, aid him in doing this intelligently.

The conception that now appears to prevail among those working in this field is that rural education is the education of those living in areas of relatively low density of population—that is, in the open country, or in communities having open-country characteristics and interests. While the exact definition of such a situation should properly vary from state to state, we shall have a fairly clear idea if we classify as rural any community with fewer than 2,500 population. This definition recognizes that country and village have much in common, and that, instead of setting up barriers by providing one school for the open country, and another for the village, the educational system should aid in the development of a fuller understanding and coöperation between the two groups. Hence, this conception of rural education would include the small elementary school in the open country, the combined elementary and secondary school in the village, and the consolidated school, whether located in the open country or in the village.

Such a school aims to offer the opportunities that will best train boys and girls for their life work, whether in the country or in the city. Rural education is, therefore, considered to be not a different kind of education from that in the city, but, rather, education carried on under rural conditions, so that the pupil may get the best possible development. The importance of this field from the national point of view may be realized when it is understood that the rural areas have about fifty-three per cent of all pupils enrolled, and fifty-eight per cent of all teachers in the public schools of the United States.

Considerable progress in modernizing the curriculum of the rural school has been made in the last decade and a half. This curriculum includes not only the regular school subjects, such as reading, geography, and mathematics, but certain extra-class experiences, such as dramatics, athletics, and literary-society and orchestra activities. These are now considered to have an important place in the curriculum, because, properly carried on, they contribute to the development of abilities needed in meeting life situations. Probably the schools in the rural areas have been somewhat slower than city schools to introduce the newer activities, yet a study of 461 small high schools in forty-seven states shows that fifty-eight per cent had an athletic association; thirty-eight per cent, a school paper or space in a local paper; thirty-six per cent, a literary club; thirty per cent, a glee club; twenty-two per cent, an orchestra; seventeen per cent, a debating club; and fourteen per cent, a Boy Scouts organization. Since a basic principle of good teaching is to

give instruction in terms of the child's experience, the more progressive rural schools are giving attention to nature study, to health problems as they are found under rural conditions, and to local geography, local history, and the like.

Naturally, many boys and girls will remain in the community in which they have been reared, or in one similar to it. Training for the agricultural occupations and for home-making rightfully has, therefore, an important place in the offerings of the progressive rural high school. Agricultural and home-making courses have been offered for many years, but their development was greatly stimulated in 1917 by the Smith-Hughes Act of the Federal government, which appropriated money for the promotion of various types of vocational training. Ten years later, 3,611 teachers of vocational agriculture in day high schools were giving instruction to 89,700 pupils under this act. The Federal government has also stimulated another type of training for rural youth, namely, the junior extension work. Through agricultural and home-making projects, it is estimated that at least 650,000 boys and girls between the ages of ten and twenty are receiving a type of training that utilizes certain resources of the rural community.

The pioneer school in America was a one-room school, controlled and financed by the people of an area limited usually to a few square miles. The elimination of this small unit so that, through the coöperation of larger groups, better facilities may be provided, has been one of the most serious problems in the improvement of rural education. In recent years, considerable progress has been made. In three states (Maryland, Louisiana, and Utah) the entire county, with the exception of the very large cities, has been made the local school unit for control and support. In about eleven other states, the smaller communities of a county (for example, in Alabama usually those under 1,000 population) are brought together to form the local district. In still other states, the township has been given control. When New Jersey adopted the township unit, in 1894, it thereby reduced the number of school districts from about 1,400 to about 400.

The bringing together of several small schools into a consolidated school has been perhaps the most widely used means of getting larger local districts. At present there are over 16,000 consolidated schools. Largely through this means, the number of one-room schools has been reduced from about 195,000 to about 160,000. This tendency should not be taken to mean that the small school has no place. Often it cannot, under present conditions, be eliminated. In such situations, every reasonable effort should be made to provide for it the

best facilities possible. It should be remembered that a large school is not likely to be superior to a small one, unless it has better teachers, more extensive curricular offerings, more adequate playgrounds and equipment, and the like. With the improvement in roads and in means of conveying pupils, we may expect a rapid development in consolidated schools. Even where it is not feasible to bring the schools themselves together, it is, of course, possible to combine the districts maintaining those schools.

The school survey has been used extensively during recent years in both rural and city systems to locate educational problems and to suggest solutions. Through it a vast number of facts regarding attendance, progress, achievement, curricula, buildings, teachers, and the like have been collected. State surveys, made recently in such states as Virginia, West Virginia, Texas, New Jersey, and Missouri, have given much attention to rural schools. A survey made in New York was devoted exclusively to them. In addition, there have been many district and county surveys.

Such studies have emphasized the need for greater financial assistance for the rural schools. Almost all the states make some provision along this line by giving special aid to the small school, for consolidation, for transportation, for tuition of non-resident pupils, for supervision, for buildings, for attaining minimum standards, or for improving salaries, and the like.

Such data as we have would indicate that the rural-school worker is neither so well trained nor so well paid as is the one in the city. Data, for example, show that teachers in one-room schools are paid a median salary of \$755; in open-country schools of three or more teachers, \$804; and in consolidated schools, \$986. These salaries may be compared with \$1,231 paid elementary teachers in cities of 5,000 to 10,000, and \$1,968 in cities of more than 100,000 population. In spite of salary conditions, the training of the rural-school worker is improving.

Because of the relatively low salaries, and the less favorable working and living conditions, it has been difficult to get the well-trained teacher to go into the smaller school. As a result, many of the teachers in these schools have secured all or most of their training in high schools. To meet this demand, high schools in some states have established training classes, generally as a part of the third or fourth year of their program, but sometimes as a fifth year. This development seems to have reached its peak about 1922-1923. At that time, twenty-four states maintained 1,712 training departments, while a few years later, the number of states had fallen to twenty-one, and the number of departments to 1,474. This trend should be a source of satisfaction

when it means, as it generally does, that the normal schools and teachers' colleges are taking over this work. These latter institutions are beginning to recognize the peculiar needs of training for rural service. J.E.B.

RURAL FREE DELIVERY. See POST-OFFICE DEPARTMENT.

RURAL SCOUTING. See BOY SCOUTS, subhead.

RUSH, a popular name for various reedlike plants. Botanically, the true rushes constitute a family of grasslike or reedlike herbs found in wet soil or water. They possess pithy or hollow stems, usually unbranched, and bear slender or sheathlike leaves, small clusters of greenish or brownish flowers, and many-seeded fruits. Most of the species are perennials. The *common rush*, also called *bulrush*, is a widely distributed marsh plant. This and other species are used in various parts of the world for making chair seats, mats, basketry, and rushlights, the latter being stripped rush stems dipped in grease or oil, to form candles. B.M.D.

Classification. The true rush family is known as *Juncaceae*, and the common rush is *Juncus effusus*. *Scouring rush* is a common name for species of *Equisetum*, also called *horsetail*.

Related Subjects. The reader is referred in these volumes to the following articles:

Bulrush	Cat-Tail	Horsetail
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RUSH, BENJAMIN (1745-1813), an American physician, prominent in almost all of the great public movements in the early history of the United States.

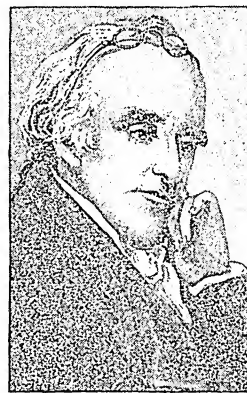


Photo: Brown Bros.

BENJAMIN RUSH

He was born at Byberry, Pa., graduated from Princeton at the age of fifteen, and in 1768 took his medical degree at Edinburgh University. In the next year he began to practice in Philadelphia, becoming at the same time professor of chemistry at the medical college in that city. He had a great interest in all reform or philanthropic movements, and was for a time president of the Society for the Abolition of Slavery.

Dr. Rush was a member of the Continental Congress, a signer of the Declaration of Independence, and during the first two years of the Revolution, saw active service in the field as surgeon general. The founding of Dickinson College was due largely to his interest in free education, and the first dispensary in the United States was established by him in 1785. He was a member of the Pennsylvania com-

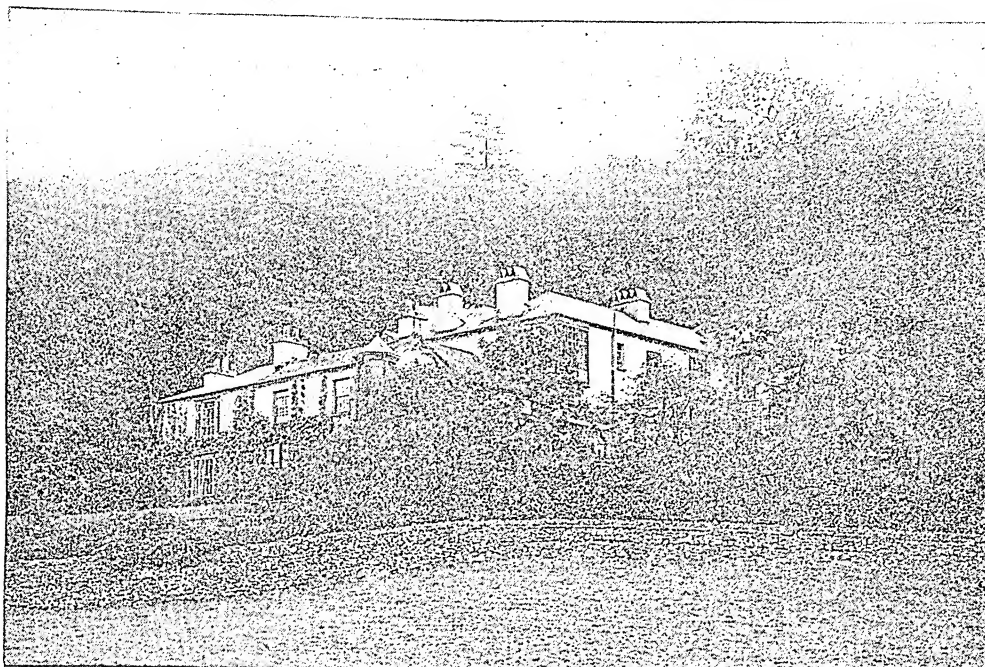


Photo: Frith

BRANTWOOD, RUSKIN'S HOME IN LANCASHIRE

mittee for the ratification of the Federal Constitution, and one of the framers of the state constitution. During the yellow-fever epidemic of 1793, he did extremely efficient work, for which he received various honors. He was treasurer of the United States Mint from 1799 until his death. Rush Medical College, in Chicago, was named for him.

RUSHLIGHT. See **RUSH**.

RUSHMORE MEMORIAL, MOUNT. See **MOUNT RUSHMORE MEMORIAL**.

RUSKIN, JOHN (1819-1900), a great English art critic, social reformer, and writer, born in London. His parents, who were well-to-do Scottish people, attended most carefully to the training of their son, securing for him the best of private instruction and taking him about with them on their extensive travels through England, Scotland, and the Continent. Moreover, his moral and spiritual development was helped by his early familiarity with the Bible, and by the practical righteousness that he saw in the lives of his father and mother. Surrounded by favorable conditions, he began to write both prose

and poetry, even before beginning his course at Oxford (1836), and while at the university, he won the Newdigate prize for his poem called *Salsette and Elephantia*.

Ruskin devoted himself chiefly to the criticism of art until 1860, when he declared himself a social reformer. He then actively interested himself in bettering the conditions of the English working classes, and spent on philanthropic undertakings the greater part of the fortune which his father left him. He greatly improved the condition of several London tenement houses, and established a model village called Saint George's Guild, where the inhabitants were to live in true social unity. He also founded and endowed educational institutions of various kinds, and otherwise proved himself most earnest in his service for humanity. From 1870 to 1879 and from 1883 to 1884, he was Slade professor of fine arts at Oxford. After resigning from this position, he lived at Brantwood, on Coniston Lake, until his death.

Ruskin exerted a definite influence on art, for in *Modern Painters* he showed the need, never before clearly recognized, of accurate observation of nature as a basis of painting; all his readers were helped to a clearer perception of the beauties of the world about them. Most important of all, he taught men to realize that "free-heartedness and graciousness, and undisturbed trust, and requited love, and the sight of the peace of others, and ministry to their pain—these and the blue sky above, and the



Photo: Brown Bros.

JOHN RUSKIN

sweet waters and flowers of the earth beneath, and mysteries and presences innumerable of living things" are the substance of wealth and the objects of labor.

His Literary Gifts to Mankind. In the year after his graduation from Oxford, Ruskin produced the first volume of his great work of art criticism, *Modern Painters*, and other volumes appeared at intervals during the next seventeen years. Before these were finished *The Seven Lamps of Architecture* and *The Stones of Venice* were published. His other works include *Unto This Last*, *Fors Clavigera*, *Sesame and Lilies*, *The Crown of Wild Olive*, and *Præterita*.

RUSSELL, GEORGE WILLIAM (1869-1935), Irish writer, the famous "Æ", was born in Lurgan, Ireland, and moved to Dublin ten years later, where he attended Rathmines School. He was one of the brilliant group that gave rise to the Irish Renaissance. Among the most versatile of men, he is perhaps best known as a mystical poet and painter. He was also an outstanding sociologist and philosopher, an ardent nationalist, and a student of economics. His works include *Homeward: Songs by the Way*; *Selected Poems*; *Co-operation and Nationality*; *The Avatars*; *The Candle of Vision*; and *The House of the Titans*.

RUSSELL, *rus' el*, LORD JOHN, first Earl Russell (1792-1878), an English statesman, twice Prime Minister. He was the third son of the Duke of Bedford. Russell was born in London and educated at the University of Edinburgh. In 1813 he was elected to Parliament, and from the first showed himself an ardent advocate of Parliamentary reform. Catholic emancipation and the repeal of the Test Act also enlisted his efforts, and when, in 1830, Earl Grey became Premier on a platform of Parliamentary reform, Lord John was made paymaster-general. With the passage of the Reform Bill of 1832 he was intimately associated. From 1835 to 1839 he was Home Secretary, and when Peel went out of office, in 1846, Lord John Russell became Premier.

He remained in this office until 1852, and his most effective work was the quieting of the turmoil in Ireland. His administration saw, too, the agitation known as Chartism (which see), and the unsuccessful attempt of the Roman Catholic Church to reestablish itself in England. Lord John served from December, 1852, to 1855 as Foreign Secretary, and in the latter year, represented England at the conference of Vienna. As Foreign Secretary under Lord Palmerston, according to his critics he violated British neutrality during the American War of Secession by his attitude on the *Alabama* question and the *Trent* affair. In 1865 he again became Prime Minister, but resigned the next year because of the defeat of a reform bill. The remainder of his life was spent in literary pursuits. He was raised to the earldom in 1861. See ALABAMA, THE; TRENT AFFAIR.

RUSSELL, LILLIAN (1861-1922), an actress and singer, who was to the American stage in the eighties and nineties what Lily Langtry was to the English stage, the incarnation of beauty and charm. From 1879, the year she was discovered in the chorus of *Pinafore*, she was a favorite. She sang ballads in Tony Pastor's Theater, New York, was a member of the famous Weber and Fields Stock Company, and prima donna of the McCaull Opera Company. She traveled throughout the United States and England with her own company. *Lady Teazle* and *Polly* were among her popular light operas, but in *The Butterfly* she created a sensation. After *Wildfire* (1907-1908), Miss Russell appeared occasionally in vaudeville. In 1912 she married Alexander P. Moore, owner of the Pittsburgh *Leader*, and made her home in Pittsburgh. During the World War she was active in the Red Cross and Liberty Loan campaigns. Before she took the stage name, Lillian Russell, her name was NELLIE LEONARD. She was born and educated in Clinton, Ia., but studied music in Chicago.

RUSSELL, SOL SMITH (1848-1902), an American actor who became famous as an impersonator and comedian. He was born in Brunswick, Me. At the beginning of the War of Secession, he joined the Federal army as drummer boy. In 1862 he left the troops to play the drum, act, and sing in a small theater in Cairo, Ill. In 1874 Smith became a member of the Augustin Daly organization, and made his first stellar appearance in 1880 in *Edgewood Folks*, presented over 1,500 times. He played best the parts which combined the whimsical and the gentle, and he found an excellent vehicle for his peculiar talents in *Peaceful Valley* and in *A Poor Relation*, both of which were written especially for him.

RUSSELL, LORD WILLIAM. See RYE HOUSE PLOT.

RUSSELL SAGE FOUNDATION, an institution established in 1907 by the widow of Russell Sage, who gave an endowment of \$10,000,000 "for the improvement of social and living conditions in the United States of America." Subsequently, the endowment was increased by \$5,000,000. The main aim is to remove the causes which result in poverty and to open the way for people to earn a living wage, thereby assuring them sanitary homes, wholesome food, and healthy children.

The Foundation is divided into a number of departments, including a charity organization whose sole purpose it is to increase the efficiency of other charities; a department which promotes improved methods of dealing with dependent, defective, neglected, and delinquent children; and a child-hygiene department, which aims to promote the physical and mental progress of children by providing them with playgrounds, sports, etc. There are com-

mittees on the prevention of blindness and also for improving the methods and efficiency of loan associations. Its most conspicuous branch is probably the Russell Sage Foundation Homes Company, which has built at Forest Hills Gardens, on Long Island, near New York

City, a group of the most attractive and convenient homes possible for a small amount of money. These are rented to people with moderate incomes. The headquarters of the Foundation are in New York City. See SAGE (family); EDUCATIONAL FOUNDATIONS.

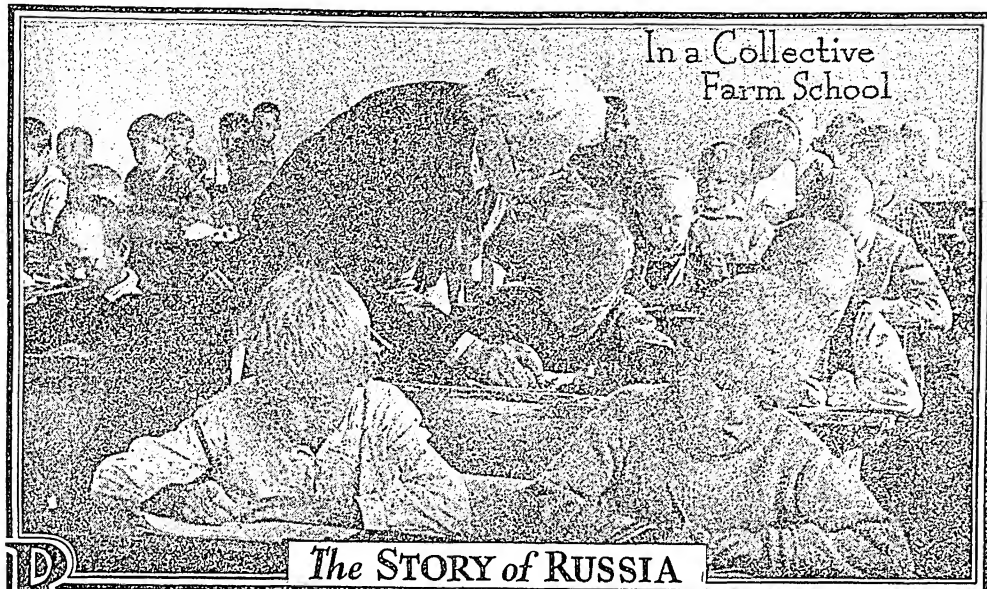


Photo: Sovfoto

RUSSIA, as an empire or as a republic, has held the world's attention. Geographically it has occupied the outskirts of the white man's domains, but the outskirts have been vast, and the world could not ignore a nation that spread over those immense reaches of Eastern Europe and Northern Asia.

Until 1917, under the double-headed eagle of the czars, the boundaries of Russia included one sixth of the earth's total land area and one twelfth of the world's population. Since 1917, under the hammer and the sickle of the Soviets, the new Russian republic has comprised more than one seventh of the world's lands. In 1940 its population was estimated at nearly 193,000,000. So peculiar was its culture, so oppressive were its rulers, that for three centuries before the revolution, this giant country was a source of mystery and an object of pity. In the last two decades the republic has been a mammoth social laboratory. Under a novel red flag it again became a realm apart, watched by the rest of humanity with hope and fear, distrust and sympathy.

As if to indicate that any foreign land was welcome to join their laboratory, the Soviets have discarded the very word *Russia* as the legal designation of the country. In 1923 it became officially the *Union of Soviet Socialist Republics*.

Location and Size. Stretching across two

continents, the Soviet Union is among the world's largest countries; second in size only to the entire British Empire. In the far north, reindeer browse upon the mosses of the frozen tundra; in the south, camel caravans carry cotton across the hot sands.

The total area of the Union of Soviet Socialist Republics (U.S.S.R.) is 8,350,000 square miles. As a result of the World War, certain western provinces were lost to Russia, forming in whole or part the independent states of Finland, Estonia, Latvia, Lithuania, Poland, and Rumania, the last named taking over the Russian province of Bessarabia. In Asia the province of Kars was ceded to Turkey. With the exception of Kars and part of Finland, all these lost territories were reannexed by the U.S.S.R. during 1939 and 1940. In 1940 the Soviet Union consisted of a federation of the following sixteen republics (populations, 1939):

The Russian Soviet Federated Socialist Republic, (R.S.F.S.R.), consisting of Soviet Russia proper including most of Siberia, is divided administratively into thirty regions, fifteen autonomous republics, and numerous smaller territories. Area, 6,372,860 square miles; population, 109,279,000; capital, Moscow.

The Ukrainian Soviet Socialist Republic was expanded in 1939 to include part of conquered Poland and in 1940 to include Northern Bucovina and part of Bessarabia, taken from Rumania. Area, 209,868 square miles; population, 39,960,000; capital, Kiev.

The White Russian Soviet Socialist Republic includes the remainder of Soviet Poland. Area, 84,633 square miles; population, 10,367,000; capital, Minsk.

The Georgian Soviet Socialist Republic is in Transcaucasia. Area, 27,020 square miles; population, 3,542,000; capital, Tbilisi.

The Armenian Soviet Socialist Republic adjoins Turkey and Iran. Area, 11,583 square miles; population, 1,282,000; capital, Erivan.

The Azerbaidzhan Soviet Socialist Republic is in southeastern Transcaucasia. Area, 33,196 square miles; population, 3,210,000; capital, Baku.

The Turkoman Soviet Socialist Republic is in central Asia. Area, 171,384 square miles; population, 1,254,000; capital, Ashkhabad.

The Uzbek Soviet Socialist Republic is also in central Asia. Area, 145,908 square miles; population, 6,282,000; capital, Tashkent.

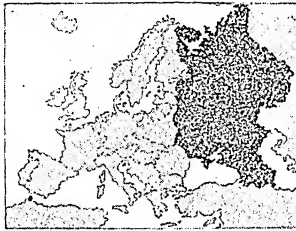
The Tadzhik Soviet Socialist Republic is in central Asia. Area, 55,584 square miles; population, 1,485,000; capital, Stalinabad.

The Kazakh Soviet Socialist Republic is in southwestern Siberia and central Asia. Area, 1,059,184 square miles; population, 6,146,000; capital, Alma Ata.

The Kirghiz Soviet Socialist Republic is likewise in central Asia. Area, 76,042 square miles; population, 1,459,000; capital, Frunze.

The Karelo-Finnish Soviet Socialist Republic includes most of the territory ceded to the Soviet by Finland in March, 1940. Area, 52,496 square miles; population, 469,100; capital, Petrozavodsk.

The Moldavian Soviet Socialist Republic includes the major part of Bessarabia, ceded by Rumania on June 28, 1940. Area, 20,381 square miles; popu-



RUSSIA IN EUROPE

Principal Cities of the Union

On the eve of World War I there were in Russia sixteen cities with a population of more than 100,000 each. By 1927 there were thirty-one such cities; and by 1939, eighty-two. Moscow and Leningrad, the largest cities, are treated separately in these volumes in their alphabetical order. The cities Samarkand, Tashkent, and Khiva are described under **UZBEK**; Ashkhabad, under **TURKOMAN**; Kharkov, Kiev, and Odessa, under **UKRAINE**; Baku, under **AZERBAIDZHAN**; Tiflis and Batum, under **GEORGIA**; Omsk, Irkutsk, Magnitogorsk, Tobolsk, Tomsk, and Vladivostok, under **SIBERIA**. Other cities, important commercially or historically, are as follows:

Arkhangelsk, *ahrk' ayn jelsk* (Archangel), capital of the Northern Region of R. S. F. S. R., an important seaport, is situated at the mouth of the River Dvina on the White Sea, about 740 miles northeast of Leningrad. It is the world's most populous city so far north, being less than 2° south of the Arctic Circle. For more than six months of the year, the port of

lation, 3,240,000; capital, Tiraspol.

The Lithuanian Soviet Socialist Republic is the former independent republic of Lithuania. Area, 20,380 square miles; population, 2,400,000; capital, Vilna.

The Latvian Soviet Socialist Republic comprises the former independent republic of Latvia. Area, 25,360 square miles; population, 1,971,000; capital, Riga.

The Estonian Soviet Socialist Republic is the former independent republic of Estonia. Area, 18,355 square miles; population, 1,131,000; capital, Tallin.

The People. The Soviet Union is inhabited by approximately 180 nationalities. The number of languages or dialects spoken in the country is estimated at 150. More than 75 per cent of the population are Slavs, including (1) Russians, sometimes also known as Great Russians; (2) Ukrainians, in the czars' time called Little Russians; and (3) White Russians. According to the census of January, 1939, Russians constituted nearly 59 per cent of the entire population of the Soviet Union, and Ukrainians 17 per cent. The rest of the people are of Finno-Ugric, Turko-Tatar, and other stocks. Of smaller numbers are Jews, Georgians, Armenians, and Germans.

His environment, history and racial mixture have made a puzzling combination of the Russian. Some writers say that strength and tenacity came from the lifelong struggle with adverse climatic conditions; resignation and patience from a consciousness of the almost overwhelming forces against which he struggled for long centuries. Add to this a brutality engendered by oppression and cruelty, and a meager background, due to lack of education, and one has a vivid picture of the Russian, a giant in size, recently laden with new responsibilities and awakened to new opportunities.

of Soviet Socialist Republics

Arkhangelsk is closed by ice. To handle increased traffic during World War I, two ice-breakers and several floating docks were installed, over a hundred warehouses were built in a year, the railway terminus was enlarged, and the road to Leningrad remade. The port also played a important part in World War II. Founded, 1584; population, 281,091 (1939).

Astrakhan, *as' trah kan*, capital of the province of the same name, and an important trading center, is situated on the delta of the Volga River, about fifty miles from the Caspian Sea. Important commerce is carried on with all Caspian ports, and with inland towns by means of the great waterway of the Volga. The town gives its name to a fur which is the skin of the new-born or stillborn Persian lamb. Vast quantities of caviar are exported from the province. Population, 253,655 (1939).

Balaklava. See **BALAKLAVA, BATTLE OF.**

Dnepropetrovsk (Dniepropetrovsk), *ne' pro pek trofsk*, formerly Ekaterinoslav, about 200 miles north of Odessa, on the Dnieper River (which see), is the steel center of the Ukraine. The great Dniestrostroy Dam and hydroelectric plant, dedicated in 1932, were destroyed in 1941 to prevent them from being used by the invading Germans. Population, 500,662 (1939).



Photos: P & A; O R O O

Scenes in Rural Russia. Above, peasant mother and daughter gathering the harvest from the fields. Below, peasant types along the Volga River.

Gorki, formerly Nizhni Novgorod, *nyish' nye nau' go rohd*, renamed in 1932 after the famed Russian writer, Maxim Gorki, who was born here in 1868. Founded in 1221, the city is known as the "Cradle of the Russian Empire," on account of its age. It was famous for the great commercial fair which was held each summer until 1930. Gorki is situated 265 miles east of Moscow, at the junction of the Volga and Oka rivers, and is the capital of the Gorki Region. The upper part of the city contains a Kremlin, or citadel, the historic buildings, the government palace, cathedrals, libraries, and schools. The lower town, built along the banks of the Oka and Volga, is the industrial section. The Soviets built here one of the largest automobile factories in the country. Population, 644,116 (1939).

Kazan, *kah zah'n*, conquered in the sixteenth century by Ivan the Terrible, at one time the chief intellectual center of Eastern Russia, is the capital of the province of Tatar, an autonomous republic within the R.S.F.S.R. It is situated on the Kazanka River, about three miles from its junction with the Volga and 430 miles east of Moscow. Kazan is a prosperous manufacturing town. Population, 401,665 (1939).

Kronstadt, *krohn' shtah't*, the most important of the northern naval stations, is situated twenty-one miles west of Leningrad, on an island in the Gulf of Finland. In its three harbors, 1,000 vessels can be accommodated. The harbors are closed by ice through five months of the year. The city was founded by Peter the Great in 1710. Population, 43,800 (1933).

Minsk, *meen'sk*, the capital of the province of the same name, in White Russia, is situated on the Svisloch River, 468 miles southwest of Moscow. It has educational institutions of quasi-university standing. There are practically no large industries. Minsk is an important station on the railway extending from

Moscow to Warsaw. Population, 238,772 (1939).

Murmansk, an Arctic Ocean port on the far northern peninsula of Kola. It is 600 miles nearer the Atlantic than Arkhangelsk on the White Sea, and, due to the influence of the Gulf Stream, its harbor is ice-free throughout the year. The town lies at the terminus of a railway connecting it with Leningrad, 700 miles distant. Population, 117,054 (1939).

Rostov-on-Don, *rahs tohv' on don'*, the administrative center of the Azov-Black Sea Region, is located twenty-seven miles from the mouth of the Don River, and is an important port and railway junction. It is a grain-collecting center and an industrial city with numerous factories equipped with modern machinery, among them Europe's largest plant for the manufacture of agricultural machinery. Population, 510,253 (1939).

Saratov, *sah rah' tohv*, the capital of the region of the same name, is picturesquely situated 450 miles southeast of Moscow, on the heights which rise from the right bank of the Volga River. Agriculture, gardening, and manufacturing are the principal industries. Population, 376,000 (1939).

Sevastopol, *se vas' toh poh'l*. See CRIMEA (The Cities).

Stalinabad, *stahl in' ah bad*, the capital of the Tadzhik S.S.R., was formerly known as Dyushambe. A large cotton mill is the chief industrial plant. It is a modern, up-to-date city. Population, 82,540 (1939).

Stalingrad, *stahl in' grad*, formerly Tsaritsyn, is the administrative center of the Stalingrad Region in the lower reaches of the Volga. It was renamed to commemorate the defense of the city in 1918 under Stalin's leadership against the White Russian armies. A noted steel and munitions center, in control of the Volga commerce, Stalingrad was a focal point of German attack in 1942. Population, 445,476 (1939).

Physical Features, Plants, and Animals

Surface. In general, Russia includes the whole of the Volga basin and the great plain which extends north to the Arctic Ocean and east to the Ural Mountains. From the Ural range, Russia extends across northern Asia to the Pacific coast; this latter area is Siberia. The plain is not absolutely level. There are low hills, or undulations, and stretches of broken country, but no point has an altitude exceeding 1,400 feet. The general level of this plain in Europe is from 400 to 600 feet. In the interior, there are heights of land extending in a north-and-south direction.

The heights of the Volga extend along the right (west) bank of that river from Gorki to Stalingrad, a distance of 730 miles, and reach an altitude of over 1,300 feet. In the southeast is the largest area in the world below sea level, the basin of the Caspian, whose waters are eighty-six feet below the Mediterranean. By annexing Estonia, Latvia, and Lithuania in 1940, the Soviet Union regained the whole eastern coast of the Baltic Sea.

The Ural Mountains, forming a part of the boundary between Russia and Siberia, are low. Their highest peaks do not exceed 5,000 feet,

and are broken by cross valleys into three sections, known respectively as the Northern, Central, and Southern Urals. These and the Yaila Mountains, on the south coast of the Crimea, are the only mountains in Russia proper; but in the Caucasus, extending between the Black and the Caspian seas, there is a range whose snow-capped peaks of 18,000 feet rival the Alps in grandeur.

Rivers and Lakes. The river systems constitute a distinguishing feature of the great Russian plain, whose extent was favorable to the development of the largest rivers of Europe, excepting the Danube. Most of the streams have their sources about the central height of land, from which they flow in all directions. With few exceptions, the rivers are deep, with slow currents and channels so completely worn that their waters are navigable for boats of light draft almost to their sources. According to their drainage, the rivers are divided into the following systems: the Arctic, Baltic, Black, and Caspian.

The Arctic system includes the rivers flowing into the Arctic Ocean and the White Sea. The most important of these are the Petchora, rising in the Ural

UNION OF SOVIET SOCIALIST REPUBLICS (EUROPEAN TERRITORY)

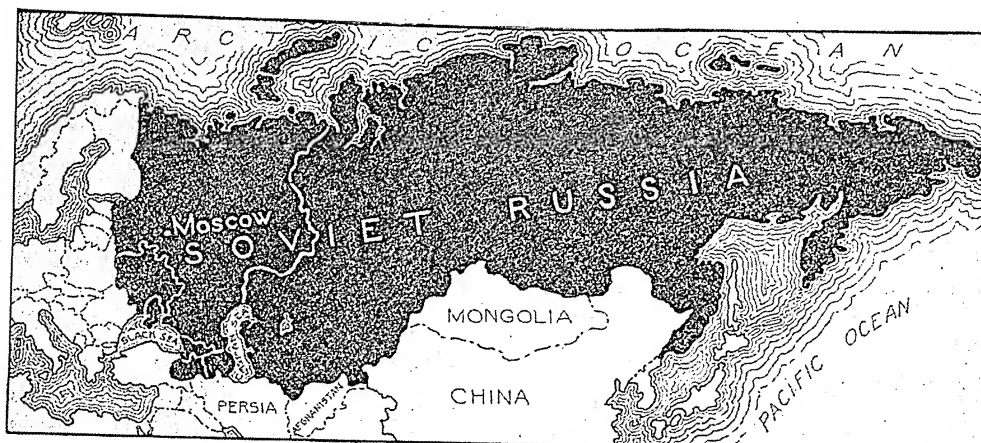
Abdulino.....	H 4	Buinaksk.....	G 6	Guriey.....	H 5	Kotelnich.....	G 3
Abkhazian Aut. S.S.R.,	F 6	Buturlinovka.....	F 4	Gus Krustalny.....	F 3	Kotlas.....	G 2
259,100.....		Buzuluk, 30,400.....	H 4	Iletskaya Zashita.....	J 4	Kotlovsk.....	C 5
Adygeisk Aut. Oblast,	F 6	Caucasus Mountains.....	G 6	Imandra Lake.....	D 3	Kovno (Kaunas)*.....	B 4
137,400.....		Chapaevsk, 57,995.....	G 4	Ioshkar Ola, 8,219.....	D 1	113,000.....	F 3
Adzharian Aut. S.S.R.,	F 6	Chaussy.....	D 4	Irbat.....	G 3	Kovrov, 67,163.....	F 3
153,800.....		Chebokarsy, 12,006.....	G 3	Ismail*, 26,123.....	C 5	Kozlov (Michurinsk),	F 4
Akhtrirka.....	D 4	Chechen Ingush Aut.	G 6	Ivanovo, 285,069.....	F 3	70,202.....	F 4
Akkerman (Cetatea	C 5	S.S.R., 650,500.....	K 3	Ivanovo Oblast, 2,428,000.....	F 3	Kramatorskaya, 93,350.....	E 5
Alba)*, 33,495.....	J 4	Chelyabinsk, 273,127.....	F 4	Izhevsk, 175,740.....	H 3	Krasni-Kholm.....	E 3
Akt'yubinsk.....	K 3	Cherbar.....	J 2	Izhma River.....	H 2	Krasnodar, 203,946.....	E 5
Alatyr, 25,567.....	G 4	Cherdin.....	E 3	Izyslavl.....	C 4	Krasnograd.....	E 5
Aleksandriya, 19,598.....	D 5	Cherchovets.....	D 4	Kabakovsk, 64,719.....	K 3	Krasnogvardeisk (Trotsk).....	E 4
Alekseevka.....	E 4	Cherkass, 51,693.....	D 5	Kabardino Balgar Aut.	F 6	Krasnokutsk.....	F 4
Amderma.....	K 1	Cherkess Aut. Oblast,	F 6	S.S.R., 278,800.....	E 5	Krasnoslovodsk.....	J 3
Ananov.....	D 5	80,700.....	C 5	Kadievka, 61,350.....	E 4	Krasnoufimsk.....	K 3
Anapa.....	E 6	Chernausti (Cernaui)*,	D 4	Kadnikov.....	E 4	Krasnovishersk.....	J 2
Apsheron Peninsula.....	H 6	109,698.....	J 4	Kaganovitch.....	D 5	Krasny Sulin.....	G 5
Archangel (Arkhangelsk),	F 2	Chernigov, 67,356.....	G 1	Kakhovka.....	E 3	Kremenchug, 89,553.....	E 6
281,091.....	G 4	Chernigovka.....	E 5	Kalinin (Tver), 216,131.....	D 3	Krimskaya.....	E 6
Ardatov.....	F 2	Cheska Bay.....	H 3	Kalinin Oblast, 3,364,600.....	D 2	Krivoi Rog, 197,621.....	D 4
Arkhangelsk (Archangel),	F 5	Chistiakovo.....	D 5	Kalininsk (Petrozavodsk),	G 5	Kronstadt.....	C 2
281,091.....		Chkalov (Orenburg),	J 4	69,723.....	E 4	Kropotkin.....	F 5
Armenian S.S.R.,	F 5	172,925.....	D 5	Kalmuk Aut. S.S.R.,	E 4	Kuba.....	G 6
1,281,599.....		Chudovo.....	D 3	185,400.....	E 3	Kuibishev (Samara),	H 4
Artemovsk, 55,165.....	F 6	Chukhloma.....	F 3	Kaluga, 89,484.....	F 5	390,267.....	G 4
Artemovsk, 25,094.....	F 5	Chusovaya.....	J 3	Kalyazin.....	D 1	Kuibishev Oblast,	G 4
Arazamas.....	F 5	Chuvash Aut. S.S.R.,	G 6	Kama River.....	D 1	4,649,800.....	F 3
Astrakhan, 253,655.....	G 5	958,500.....	D 5	Kamenets Podolsk, 33,035.....	F 1	Kungur, 28,900.....	J 3
Atkarsk.....	G 4	Crimean Aut. S.S.R.,	F 3	Kamyshevsk, 50,897.....	E 3	Kuntsevo, 60,963.....	E 3
Azerbaijan S.S.R.,	G 6	791,000.....	D 5	Kandalaksha, 7,799.....	E 4	Kupyansk.....	E 5
3,209,727.....		Daghestan Aut. S.S.R.,	F 3	Kandalaksha Gulf.....	E 4	Kursk, 119,972.....	E 4
Azov, 19,266.....	E 5	942,200.....	G 6	Kanin Peninsula.....	E 4	Kursk Oblast, 5,268,100.....	E 4
Azov, Sea of.....	E 5	Danilov.....	F 3	Kanin Pt.....	E 4	Kutaisi, 81,479.....	F 6
Babaevo.....	E 5	Davlekanovo.....	H 4	Kara Bay.....	E 4	Kuznetsk, 34,000.....	G 4
Bakhmach.....	E 3	Derbent, 27,476.....	G 6	Karachaev.....	E 4	Kyshtym.....	K 3
Baku, 809,347.....	G 6	Desna River.....	D 4	Karachaev Aut. Oblast,	F 6	Labinak.....	F 6
Balakhna.....	F 3	Detskoe Selo, 45,700.....	D 3	104,400.....	J 1	Lacha, Lake.....	E 2
Balaklava.....	D 6	Dmitriev.....	E 4	Kara Strait.....	E 2	Ladoga, Lake.....	D 2
Balakovo.....	G 4	Dmitrov.....	E 4	Karelian Aut. S.S.R.,	E 3	Lalsk.....	G 2
Balashov, 31,439.....	F 4	Dneprovsk.....	D 5	372,100.....	E 4	Lapladiya.....	D 1
Balta, 21,163.....	C 5	Dneprozhersk.....	D 5	Kargopol.....	E 4	Lebedin.....	D 4
Baltser.....	G 4	147,829.....	D 5	Kashin.....	E 3	Lebedyan.....	E 4
Bar.....	C 5	Dnepropetrovsk, 500,662.....	D 3	Kashira.....	E 5	Leninakan, 67,707.....	F 6
Baranovichi (Baranov-	C 4	Dno.....	D 3	Kasimov.....	E 5	Leningrad, 3,191,304.....	D 2
viche)*, 22,848.....		Dubrovno, 8,390.....	D 3	Kazan, 401,665.....	E 4	Leningrad Oblast,	D 3
Bashkir Aut. S.S.R.,	J 4	Dvina River.....	D 3	Kazatin.....	E 4	6,641,900.....	D 3
2,889,300.....	E 5	Dvinsk (Daugavpils)*,	D 3	Kerch, 104,471.....	D 5	Leninsk.....	E 3
Bataisk.....	E 5	45,160.....	C 3	Khar'kov, 833,432.....	D 5	Leninskoe.....	G 5
Batraki.....	G 4	Dyatkhovo.....	D 4	Kharovsk.....	D 5	Lenkoran.....	G 7
Batumi, 70,807.....	F 6	Dzerzhinsk, 103,415.....	F 3	Kherson, 97,186.....	F 4	Lesno.....	D 1
B. Bolozerna.....	D 5	Dzhankoi.....	D 5	Kholmogori.....	D 4	Lida*, 19,490.....	C 4
Belaya Glna.....	F 5	Eftremov, 20,341.....	E 4	Khopor River.....	E 5	Liman.....	E 5
Belaya River.....	H 3	Eisk.....	E 3	Khorol.....	D 4	Lipetsk, 66,625.....	E 4
Belaya Tserkov.....	D 5	Elabuga.....	E 5	Khvinsk.....	H 4	Lisichansk.....	E 5
Belcei.....	H 4	Elan.....	F 4	Kin.....	E 4	Lisva.....	J 3
Belev.....	E 4	Elbrus (mt.).....	F 6	Kinelsk Cherkassi.....	F 3	Livny.....	E 4
Belgorod.....	E 2	Elets, 50,888.....	F 5	Kineshma, 75,378.....	E 3	Lodeinopol.....	D 2
Beloe Lake.....	J 4	Elista, 8,500.....	G 4	Kirillov.....	E 3	Lokhvitsa.....	D 4
Beloretsk.....	E 2	Engels, 73,279.....	F 6	Kirov.....	D 4	Losovaya.....	E 5
Belostok (Bialystok)*,	B 4	Erivan, 200,031.....	F 5	Kirov (Viatska), 143,181.....	G 3	Luga, 24,200.....	D 3
91,335.....	E 3	Essentuki.....	F 6	98,743.....	G 6	Lukyanov.....	F 3
Belozersk.....	C 5	Evpatoria.....	E 6	Kirovakan.....	F 6	Lyudinovo.....	D 4
Berdichev, 66,306.....	E 5	Feodosiya.....	H 3	Kirovo.....	D 5	Magnitogorsk, 145,870.....	J 4
Berdiansk, 51,664.....	D 4	Fosforitnaya.....	D 4	Kirov Oblast, 2,445,600.....	G 3	Maikop, 67,302.....	E 6
Bereznia.....	J 3	Gadyach.....	C 5	Kirovsk, 29,000.....	D 1	Makarev.....	F 3
Berezni, 63,575.....	D 5	Gaisin.....	F 3	Kirsanov, 23,546.....	F 4	Makeevka, 240,145.....	E 5
Berislav.....	K 2	Genichesk.....	E 5	Kishinev (Chisinau)*,	C 5	Makhach Kala, 86,847.....	G 6
Berizovo.....	C 4	Geokchai.....	G 6	112,500.....	E 4	Malaya Vishera.....	D 3
Bikhov.....	F 5	Georgian S.S.R.,	F 6	Kislovodsk, 51,289.....	F 6	Malmzh.....	H 3
Blagodarnoe.....	D 5	3,542,289.....	F 6	Kizel.....	J 3	Maloarkhangelsk.....	E 4
Bobrinsk.....	C 4	Georgievsk, 21,629.....	F 6	Kizlyar.....	G 6	Mamadysh.....	H 3
Bobrov.....	E 4	Germans Volga Aut.	G 4	Klimovichi.....	D 4	Mari Aut. S.S.R.,	G 3
Bobruisk, 84,107.....	F 3	S.S.R., 575,700.....	H 3	Klintsy.....	D 4	550,900.....	G 3
Bogodukhov.....	D 3	Glazov.....	H 3	Koidopoga.....	D 2	Mariupol, 222,427.....	E 5
Bogoroditsk, 7,180.....	H 3	Glukhov.....	D 4	Kola Peninsula.....	E 1	Marksshtadt.....	G 4
Bogorodskoe.....	F 4	Gornel, 144,169.....	D 4	Kolchugino.....	E 3	Medvezhya Gora.....	D 2
Bolkhov.....	E 4	Gori.....	F 6	Kolguev Island.....	G 1	Melenki.....	F 3
Bologoe.....	D 3	Gorki (Nizhni Novgorod),	F 3	Kolonna, 75,139.....	E 3	Melitopol, 75,735.....	E 5
Bondyuzhski.....	C 4	644,116.....	F 3	Kolva R.....	J 1	Mena.....	D 4
Borisoglebsk, 52,055.....	E 4	Gorki Oblast, 3,522,200.....	F 3	Komi Aut. S.S.R.,	H 2	Menzelinsk.....	H 3
Borisov, 33,426.....	D 3	Gorlovka, 108,693.....	E 5	276,300.....	E 5	Merfa.....	E 5
Borisovka.....	J 3	Gorodets.....	C 3	Konintern.....	D 4	Meshchovsk.....	D 4
Borovich, 28,400.....	F 6	Grodok.....	D 4	Konotop, 36,186.....	K 3	Metallist.....	F 3
Borovsk.....	D 5	Grodno*, 49,818.....	G 6	Kopeisk.....	E 5	Mezen.....	F 1
Brest Litovsk (Brzesc	H 4	Grozny, 172,468.....	F 3	Korenovsk.....	C 4	Mezen, Gulf of.....	F 1
nad Bugiem)*, 48,435.....	B 4	Gryazovets.....	F 3	Korosten.....	G 2	Mezen River.....	G 2
Dryansk, 87,473.....	F 6	Gudakha.....	J 3	Koslansk.....	F 3	Michurinsk (Kozlov),	F 4
Budennovsk.....	D 5			Kostroma, 121,205.....	F 3	70,202.....	F 4
Bug River.....						Mikhailovskoe.....	F 4
Buguruslan.....							

UNION OF SOVIET SOCIALIST REPUBLICS *Continued*

(EUROPEAN TERRITORY)

Mikoyan Shakh, 2,848.	F 6	Osipovichi.	C 4	Shenkursk.	F 2	Ufa, 245,863.	J 4
Millerovo.	F 5	Ostrogzhsk.	E 4	Shepetovka.	C 4	Ufa River.	J 3
Mineralne Vodi.	F 6	Ostrov.	C 3	Shklov.	C 4	Ukrainian S.S.R.,	
Minsk, 238,772.	C 4	Ozeri.	E 4	Shostka.	D 4	30,960,221.	F 5
Mitava (Jelgava)*, 34,099.	B 3	Paikhoi Peninsula.	K 1	Shuya, 57,950.	F 3	Ulan.	G 5
Mogilev, 99,440.	C 4	Pai Yar (mt.).	K 1	Siauliai*, 35,000.	B 3	Ulyanovsk (Simbirsk),	
Mogilev Podolski.	C 5	Pavlograd.	E 5	Simferopol, 142,678.	D 6	102,106.	G 4
Moldavian, 615,500.	C 5	Pavlovsk.	F 4	Slavyansk, 75,542.	E 5	Uman, 40,471.	D 5
Molotov.	J 3	Pechora River.	H 1	Slobodskoi.	H 3	Ural River.	J 4-H 5
Mordvian Aut. S.S.R.,		Peipus, Lake.	C 3	Sluts.	C 4	Uralsk, 66,201.	H 4
1,414,600.	F 4	Penza, 157,145.	F 4	Smela.	D 5	Uryupinsk.	F 4
Morshansk.	F 4	Pereslavl.	E 3	Smolensk, 156,677.	D 4	Uzrum.	H 3
Moskva (Moscow,		Pereyaslav.	D 4	Smolevichi.	C 4	Usa River.	K 1
capital), 4,137,018.	E 3	Perm, 255,196.	J 3	Sochi.	E 6	Usman.	F 4
Moskva Oblast,		Pernov (Parnu)*, 20,334.	B 3	Sokol.	F 3	Ust-Kulom.	H 2
11,016,000.	E 3	Pervomaisk.	D 5	Soligalich.	F 3	Ust Labinsk.	E 5
Mozhaik.	E 3	Pestovo.	E 3	Solkamsk.	J 3	Ust Tsilma.	H 1
Mozhdok.	G 6	Petrovsk.	C 4	Solnechnogorsk.	E 3	Ust Usa.	J 1
Mozhga.	H 3	Petrovsk, 17,312.	G 4	Solvychegodsk.	G 2	Ustvinskoe.	H 2
Mtn. Karabagh Aut.		Petrozavodsk (Kalininsk).		Soroca*, 14,661.	C 5	Ustyuzhna.	E 3
Oblast, 153,900.	G 6	69,723.	D 2	Sorochinsk.	H 4	Vaga River.	F 2
Mtsensk.	E 4	Pinaga.	F 2	Sosna River.	E 4	Valga*, 10,842.	C 3
Murmansk, 117,054.	D 1	Pinaga River.	F 2	Sosnovka.	F 4	Valuiki.	E 4
Murmansk District.	E 2	Pinsk*, 31,913.	C 4	Sosva River.	K 2	Vasilkov, 14,866.	C 4
Murom, 26,837.	F 3	Plesetsk.	F 2	South Ossetian Aut.		Velikie Luki, 26,474.	D 3
Nakhichevan, 11,742.	G 7	Pochep.	D 4	Oblast, 95,300.	F 6	Veliki Ustyug, 23,382.	G 2
Nakhichevan Aut. S.S.R.,		Podolsk, 72,422.	E 3	South Ural Mountains.	J 4	Velizh, 10,167.	D 3
117,000.	G 7	Pokrovski-Rud.	J 2	Stalingrad, 445,476.	F 5	Velsk.	F 2
Nalchik.	F 6	Polonnoe.	C 4	Stalingrad Oblast,		Vereshchagin.	H 3
Naro Forminsk.	E 3	Polotsk, 24,816.	C 3	2,397,500.	G 5	Verkhne Uralsk.	J 4
Narva*, 23,512.	C 3	Poltava, 130,305.	D 5	Stalinir, 7,333.	F 6	Vesegonsk.	E 3
Naryan Mar.	H 1	Ponevievz (Panevezys)*,		Stalino, 462,395.	E 5	Vetluga.	G 3
Netegorsk.	F 6	23,947.	C 3	Stalinnogorsk, 76,207.	E 4	Vetluga River.	G 3
Nevel.	C 3	Ponoi.	F 1	Staraya Russa, 26,700.	D 4	Viborg (Viipuri)*,	
Nevinnomyssk.	F 6	Ponoi River.	E 1	Stari Oskol, 26,697.	E 4	71,944.	C 2
Nezhin, 41,406.	D 4	Porkhov.	C 3	Staritsa.	D 3	Vichuga.	F 3
Nikitinka.	D 3	Poti, 16,671.	F 6	Starobelsk.	E 5	Vilgort.	H 2
Nikolaev, 167,108.	D 5	Priluki, 28,754.	D 4	Starodub.	D 4	Vilna (Vilno)*, 196,345.	B 4
Nikolsk.	G 3	Pripyat River.	C 4	Staro Konstantinov.	C 5	Vinnitsa, 92,868.	C 5
Nikopol, 57,841.	D 5	Proskurov, 28,251.	C 5	Starominsk.	E 5	Vitebsk, 167,424.	D 3
Nizhni Lomov.	F 4	Pskov, 59,898.	C 3	Stavropol.	G 4	Vladimir, 66,761.	F 3
Nizhni Novgorod		Pugachev.	G 4	Stepanakert, 5,436.	G 7	Vodi Lake.	E 2
(Gorki), 644,116.	F 3	Pyatigorsk, 62,875.	F 6	Sterlitamak, 25,155.	J 4	Volchansk.	E 4
Nizhni Tagil, 159,864.	J 3	Pyatikhatka.	D 5	Stolpce*.	C 4	Volga River.	F 3-G 5
Noginsk, 81,024.	E 3	Radomyshi.	C 4	Sudzha.	E 4	Volkov River.	D 3
Northern Oblast,		Rasskasovo.	F 4	Sukhinichi.	E 4	Vologda, 95,194.	F 3
2,435,300.	F 2	Rechitsa.	C 4	Sukhona River.	F 2	Volsk, 55,053.	G 4
North Ossetian Aut.		Revel (Tallinn)*, 137,792.	B 3	Sukhum, 28,136.	F 6	Voronezh, 326,836.	E 4
S.S.R., 286,200.	F 6	Rezekne*, 13,131.	C 3	Sulimov, 21,954.	F 6	Voronezh Oblast,	
North Ural Mountains.	K 1	Riga*, 385,063.	B 3	Sumi, 63,883.	D 4	6,918,000.	F 4
Nosovka.	D 4	Rogachev.	D 4	Svenigorodka.	D 5	Voroshilovgrad, 213,007.	F 5
Novaya Zemlya.	J 1	Rolinki.	F 3	Sverdlovsk, 425,544.	J 3	Voroshilovsk (Ordzhoni-	
Novgorod, 37,300.	D 3	Romi.	D 4	Svir River.	E 2	kidze), 85,100.	F 5
Novgorod-Severski.	D 4	Roslavl, 28,974.	D 4	Svirstroil.	D 2	Voroshilovsk (Ukrainian	
Novi Bug.	D 5	Rossosh.	E 4	Svoboda.	E 4	S.S.R.), 70,628.	E 5
Novo Aitar.	E 5	Rostov na Donu (Rostov		Sychevka.	D 3	Votkinsk.	H 3
Novo Astrakhan.	E 5	on Don), 510,253.	E 5	Sykytykar.	H 2	Vozhe Lake.	E 2
Novocherkassk, 81,286.	F 5	Rostov Oblast.	F 5	Syzran, 77,679.	G 4	Voznesensk, 7,830.	D 5
Novograd Volinski.	C 4	Rovno (Rowne)*, 40,788.	C 4	Taganrog, 188,808.	E 5	Vyatka River.	G 3
Novokhopersk.	F 4	Rtishevo.	F 4	Tambov, 121,285.	F 4	Vyzama.	D 3
Novorossisk, 95,280.	E 6	Russian Soviet Federated		Tarashcha.	D 5	Vychegda River.	G 2
Novo Ukrainia.	D 5	Socialist Republic,		Tarnopol*, 35,831.	C 5	Vyska.	F 3
Novouzensk.	G 4	109,278,614.	J 4	Tatar Aut. S.S.R.,		Vysnyi-Volochek, 63,642.	D 3
Novozibkov, 19,345.	D 4	Russki, Cape.	H 1	2,784,900.	H 3	Western Oblast,	
Nukha, 26,262.	G 6	Ruzavka.	F 4	Tavda River.	K 3	5,256,100.	D 4
Nyandoma.	F 2	Ryazan, 95,358.	E 4	Tbilisi (Tiflis), 519,175.	G 6	White Russian S.S.R.,	
Nyuvchim.	H 2	Rybachi Peninsula.	D 1	Teikovo.	F 3	5,567,976.	C 4
Ob River.	L 1	Rybink, 139,011.	E 3	Temryuk.	E 5	White Sea.	E 1
Oboyan.	E 4	Rzhev, 54,081.	D 3	Tetyushi.	G 4	Yalping Ner (mountain).	J 2
Odessa, 604,223.	D 5	Salegard (Obdorsk).	L 1	Tiflis (Tbilisi), 519,175.	G 6	Yalta.	D 6
Oka River.	F 4	Salyani.	G 7	Tigina (Benderi)*, 31,698.	C 5	Yaman Tau (mountain).	J 4
Olonets.	D 2	Samtredi.	F 6	Tikhoretsk.	F 5	Yaransk.	G 3
Omutinsk.	H 3	Saransk.	F 4	Tikhvin.	D 3	Yaroslavl, 298,065.	E 3
Onega.	E 2	Sarapul, 32,400.	H 3	Timan Mountains.	H 1	Yaroslavl Oblast,	
Onega Bay.	E 2	Saratov, 375,860.	G 4	Timoshevsk.	E 5	2,097,500.	F 3
Onega, Lake.	E 2	Saratov Oblast, 2,332,300.	G 4	Tirlyanski.	D 5	Yartsevo.	D 3
Onega River.	E 2	Sasovo.	F 4	Top, Lake.	D 1	Yukhnov.	D 4
Oposhnaya.	D 5	Satski-Rud.	K 2	Toropets.	D 3	Yurev (Tartu)*, 58,876.	C 3
Oranienbaum.	C 3	Schlossburg.	D 3	Torzhok.	D 3	Yurevets.	F 3
Ordzhonikidze, 127,172.	F 6	Sebez.	C 3	Totma.	F 3	Zaporozhe, 289,188.	D 5
Ordzhonikidze, 88,246.	E 5	Seg, Lake.	D 2	Trembovka*.	C 5	Zaraisk.	E 4
Ordzhonikidzeograd,		Semenov.	F 3	Troitsk-Pechorsk.	J 2	Zdolbunov*.	C 4
92,331.	D 4	Serafimovich.	F 5	Trubchevsk.	D 4	Zeleny Dol.	G 3
Ordzhonikidze Krai.	F 5	Serdobsk.	F 4	Tsurupinsk.	D 5	Zhitomir, 95,090.	C 4
Orehov.	E 5	Sereda.	F 3	Tuapse.	E 6	Zhidra.	E 4
Orehovo-Zuevo, 99,329.	E 3	Sergach.	G 3	Tula, 272,403.	E 4	Zhlobin.	D 4
Orel, 110,567.	E 4	Serpukhov, 90,766.	E 4	Tulchin.	C 5	Zhmerinka.	C 5
Orenburg (Chkalov),		Sevastopol, 111,946.	D 6	Tura River.	K 3	Zlatoust, 99,272.	K 3
172,925.	J 4	Severnaya Dvina (river).	F 2	Tutaev.	E 3	Znamenka.	D 4
Orenburg Oblast,		Shakhty, 155,081.	F 5	Tver (Kalinin), 216,131.	E 3	Zolotonosha.	D 5
1,610,700.	H 4	Sharya.	G 3	Udmurt Aut. S.S.R.,			
Orsha, 31,308.	D 4	Shatsk.	F 4	871,400.	H 3		
Orsk, 65,799.	J 4	Shchigri.	E 4				

*—Towns formerly in Finland, Estonia, Latvia, Lithuania, Poland and Rumania.



EXTENT OF RUSSIAN RULE

Mountains; the Northern Dvina, noted for volume of waters; and the Onega, flowing into the White Sea.

The Baltic system includes the Neva, the outlet of Lake Ladoga, a stream of great volume, upon whose banks Leningrad is situated; and a number of smaller streams.

From west to east, the principal rivers from Russia flowing into the Black Sea are the Dniester and the Bug, both of which are navigable; and the Dnieper, the second largest river of Russia, draining an area as large as France. The Don flows into the Sea of Azov, an arm of the Black Sea. Its chief tributary is the Donetz.

The chief river flowing into the Caspian Sea is the Volga, the largest river of Europe, called in national songs Mother Volga. The Oka and the Kama are tributaries of the Volga. Another river emptying into this sea is the Ural, whose shallow waters contain an abundance of fish.

There are numerous lakes in the northeastern section; Lake Ladoga, the largest, has an area of 7,019 square miles and is about the size of Lake Ontario. Lake Onega, about one half as large, is the second in size. Many of the lakes are connected by streams, and in the far north, some of them blend with the marshes of the lowlands.

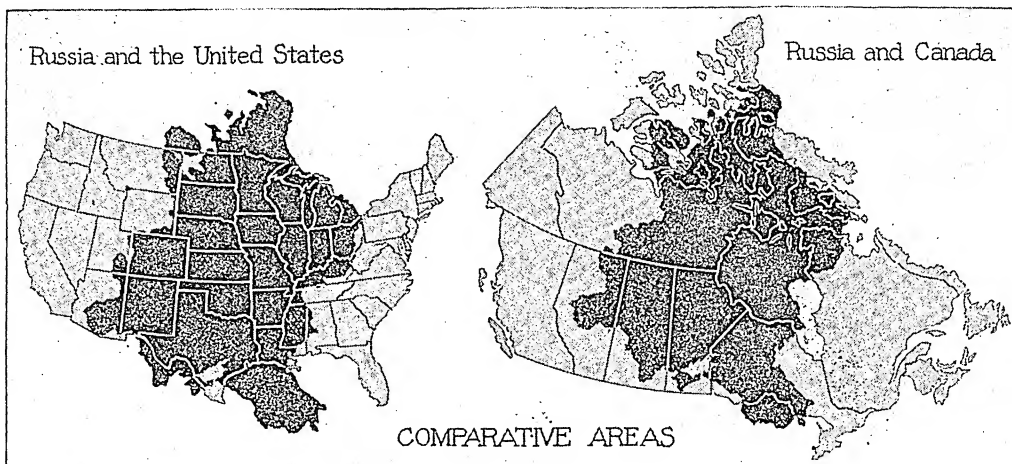
Climate. The surface of Russia is reflected in its climate. The absence of lofty highlands and the southerly slope of the principal watersheds modify to a considerable extent the difference in latitude. The Arctic Ocean exerts some influence over the climate of the extreme north, but the Baltic and the Black seas are too small to affect so large a plain. In general, the climate is continental; that is, the winters are cold and the summers warm. The difference between the mean summer and winter temperature amounts to 40° F. in some parts and to 63° in others, the difference increasing from south to north, at the rate of about 9.7° F. for each degree of latitude. From west to east, the difference in temperature is more marked. The temperate winds from Western Europe raise the mean temperature

of the western part of the country, but the southeast winds from Asia are cold and raw. There is, of course, a marked difference between the region bordering on the Arctic Ocean and that around the Black Sea. The former lies within the Arctic Zone, and is in the grip of ice and snow for about eight months each year; the latter lies in the warm temperate region, where the grape and the palm thrive. The transition from one extreme to the other, however, is gradual. The average temperature of Leningrad is 15° F. for winter and 64° for summer, and the temperature at Odessa is about the same as that of Boston.

The rainfall is less than that required for agriculture in the United States. It decreases from the northwest to the southeast. It is eighteen inches at Leningrad, fourteen inches at Kazan, and five at Astrakhan. A heavy mantle of snow covers the entire country during the winter, and contributes immeasurably to the fertility of the soil.

In Leningrad the longest day lasts eighteen hours and forty-five minutes. For two months during the long winter there is practically no sunlight. In the southern part of the country, the length of day and night corresponds to that in the northern half of the United States for the same season of the year.

Plants. The Arctic zone of vegetation, whose southern boundary practically coincides with the Arctic Circle, consists of the tundra, and this is frozen a large portion of the year. Here the plants consist chiefly of mosses and lichens, a few hardy shrubs, and, in places where humus has accumulated, flowering plants which can withstand the severity of the climate. South of this is the great belt of evergreen or coniferous forests, which extends southward to an irregular line drawn from the Gulf of Finland to the southern end of the Ural Mountains. To the south and west is the hardwood forest, which blends on its southern and eastern border



EUROPEAN RUSSIA AND THE UNITED STATES AND CANADA COMPARED

If Siberia were added to the black area the vast combined sweep of Russia would be more than twice as great as the area of either of the great American democracies.

with the grassy plains, or steppes, that occupy the southeastern portion of the country.

The larch, silver fir, birch, and other trees characteristic of a subarctic climate are found in the northern part of the forest belt. This border gradually merges into the grand forest of magnificent evergreen trees, in which pine and fir predominate. Forest areas, separated by impassable marshes, dense thickets, and numerous lakes are the leading features of this region.

The hardwood forest, or oak region, as it is sometimes called, occupies all of Central Russia, and is characterized by a rolling surface and forests of oak, birch, and other hardwood trees, interspersed in sandy places with Scotch pine. The forests are separated by open spaces occupied by farms and villages, imparting to the landscape a pleasing variety of woodland and meadow.

In their native condition, the steppes were covered by a luxuriant growth of wild grass and flowers. Such trees as the wild cherry and wild apricot are found on the slopes bordering streams, and thickets of willows are found in the depressions. However, nearly all this re-

gion has been changed by cultivation, and fertile fields and green pastures are seen on every hand.

Animals. In the region within the Arctic Circle, the seal, the polar bear, and the reindeer are found. The great forest south of this region is the home of many fur-bearing animals, although some of the most valuable species have been nearly exterminated by hunters. Here are found bears, wolves, foxes, elk, deer, wild boars, and gluttons. In the more open forests of the central part of the country, squirrels, hares, and many other small animals occur in large numbers. The agricultural region contains a number of animals of the marmot family, which, because of their destruction of crops, are pests. During summer, the fields and forests of the entire country are enlivened by the flight and song of birds common to the cool temperate regions of Europe and North America. In the north, thousands of wild geese, ducks, and other waterfowl frequent the marshes during the nesting season. The lakes and rivers of this region abound in fish.

Sources of Russia's Wealth

Minerals and Mining. In this country of great mineral wealth, mining developed less rapidly than in other European countries, previous to 1890, because of scarcity of capital and lack of transportation facilities. Before the beginning of the present century, however, the iron and coal industries made rapid progress, largely owing to investments by French and Belgian capitalists, and the introduction of scientific methods of mining and smelting. The principal coal and iron-ore districts in European Russia are in the Ukraine (the

Donetz Basin and the Krivoi Rog region), and in the Urals. Siberia has over 388,000,000,000 metric tons of coal reserves. Just before the outbreak of World War I, Russia was producing three fourths of the coal, four fifths of the pig iron, and practically all of the steel used in the country.

Then came the years of upheaval resulting from the war and its aftermath, the revolution. The tremendous losses suffered by the mining industries may be realized from a comparison of prewar and postwar figures for

coal: whereas, in 1913, the production of coal within the present territory of the Soviet Union was 29,053,100 metric tons, by 1921 the output had declined to 10,000,000 tons, a decrease of about two thirds. Following this ebb in the fortunes of the country, there was a reconstruction period of four to five years, during which the Soviet Union, without the aid of foreign capital, brought its coal production above the prewar maximum; increasing year by year, a yield of 93,500,000 metric tons was reached in 1934; and a comprehensive plan of further development was formulated. This project included the sinking of new shafts in the Donetz Basin and in the Urals, and the opening of new mines in Siberia; the total coal output for 1938 amounted to 132,900 metric tons. The production of peat also increased from 1,724,000 tons before the war to 5,311,400 tons in 1928; 17,200,000 in 1934; and 26,450 tons planned for 1938.

The iron and steel industry made a slower recovery, but by the two Five-Year Plans (1928-1937) was practically created anew. Machinery destroyed during the war was replaced by modern equipment, and gigantic steel mills were erected in all the regions of raw material.

Russia has rich oil deposits, the principal districts being those of Baku, west of the Caspian Sea (in Azerbaidzhan); Grozny, in Northern Caucasia; Emba, to the north of the Caspian; and the Pacific island of Sakhalin. The prewar production of 9,234,900 metric tons (1913) declined over one half, reaching 4,000,000 tons in 1921. By 1929 the output had nearly tripled; in 1939 Russia ranked third in world production with an output of 29,530,000 metric tons.

The Urals are a treasure house of minerals occurring in wide variety, some of which are awaiting exploitation on a large scale. Here are potassium salts, gold, nine tenths of the world's supply of platinum; and copper, manganese, and asbestos, the deposits of the last-named being estimated at 20,000,000 tons. Rich copper deposits are found in the Caucasus Mountains, and the Georgian Republic and the Ukraine are valuable sources of manganese. Silver, lead, mercury, chromium, pyrites, graphite, sulphur, asphalt, mica, zinc, phosphate rock, nickel, antimony, bismuth, arsenic, bauxite, and salt are all found in quantities in widely scattered areas. In general, the Soviet Union imports almost no minerals, the domestic production supplying home needs with the exception of certain non-ferrous metals. On the other hand, oil, coal, asbestos, manganese, and iron ore are being exported.

Fisheries. The waters on the northwest coast and the rivers and lakes abound in the best varieties of food fish, including cod, salmon, and sturgeon, the last-named furnishing an excellent grade of caviar. The Caspian

Sea and rivers flowing into it are the chief sources of the industry, but the White Sea, the Arctic, and the Far Eastern fisheries have been greatly developed in more recent times. Everywhere the fishing fleets have been expanded and modernized, and refrigerating plants and canneries built. The catch for 1937 was estimated at 1,800,000 tons—an increase of 139 per cent compared with 1932. Fish and fish products, including caviar, are consumed at home as well as exported.



THE BLACK-EARTH BELT

This "granary of Russia," which extends across Southern Russia, is one of the most fertile as well as one of the most extensive arable plains on the globe. It owes its name to a layer of blackish humus, varying in thickness on the average from one foot and a half to five feet.

This black-mold belt stretches in one long band across the whole of European Russia. Notwithstanding its faulty cultivation, this region, like the Mississippi Valley, is one of the world's immense storehouses of grain.

Agriculture. Agriculture is the chief occupation of over three fourths of the population. The variation in temperature and rainfall over so wide an extent of territory makes a variety of agricultural interests necessary. In the extreme north, agriculture cannot be practiced, but elsewhere crops can be grown. In the region of the great forests there are but few farms, but throughout the great area south of and east-and-west line passing through Lenin-grad, most of the land not forested is under tillage. In the southeast is the great black-earth region, constituting one of the greatest wheat countries in the world. It is from this region that Russia before the revolution exported about 100,000,000 bushels of wheat each year, supplying 25 per cent of world wheat exports, yet often starving itself. Using the wheat to feed its own population, the Soviet Union supplied in 1931 only 15 per cent of the total wheat exports of the world, and but 5 per cent in 1933.

Among the other crops are rye, oats, barley, potatoes, millet, corn, sunflower, and buckwheat. Flax (for fiber and seed), hemp, sugar beets, and cotton are also important. During

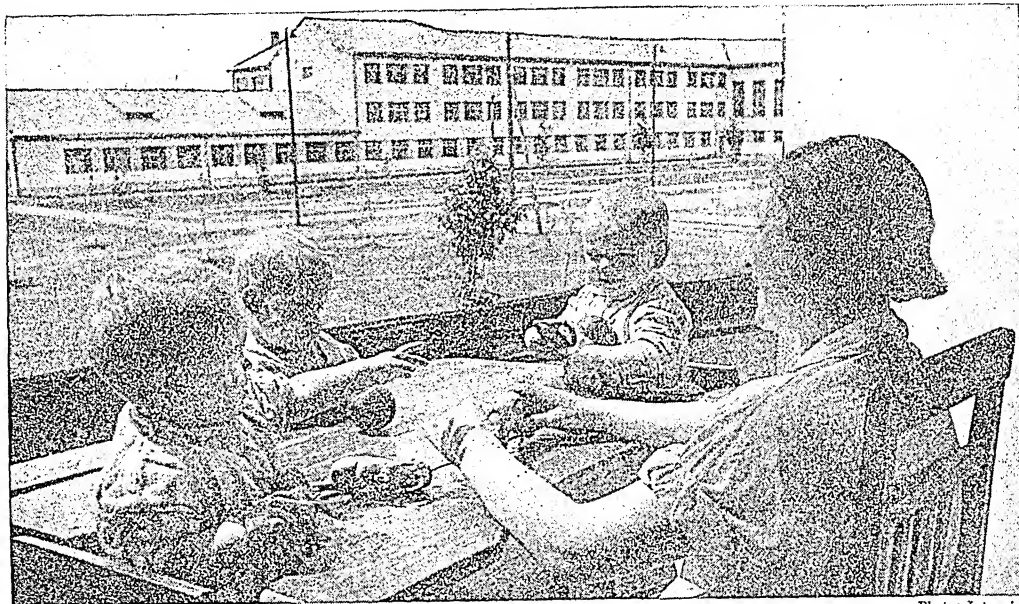


Photo: Intourist

A DAY NURSERY IN AN INDUSTRIAL REGION

World War I and the revolution, cattle raising and the production of other animals suffered greatly; but in recent years there has been a gradual restoration of the livestock industry.

Before the war, about 12 per cent of the total grain crop was produced by large land-owners. There were, in addition, the rich peasants, the so-called *kulaks* or "fists," with extensive land holdings, who were numerically a small group, but produced about 38 per cent of the crop. In consequence, the middle-class and poorer peasants, constituting by far the majority of the peasant population, produced only half the crop. After the revolution, the land was redistributed in such a way that the middle-class and poorer peasants now produce most of the crop. All land belongs to the state. The peasants cultivate the land under a system of perpetual leaseholds. The total area under cultivation in Russia in 1939 was 345,553,000 acres.

By 1932, about 150,000 tractors were in use in the Soviet Union, most of them imported from the United States. The country was also producing tractors at the rate of several thousand a year, and in 1938 the number of tractors in use rose to 483,500. An important phase of agricultural development is the establishment of a number of state grain farms, which are operated by the government according to the latest methods, and which use modern tractors and other machinery. In order to increase the production of grain, the Soviet Union is also striving to have groups of peasants work together in so-called "collectives," which can

use modern machinery to better advantage because of the larger acreage under cultivation. In 1938, 93.5 per cent of all peasant households were members of collective farms.

Forests. The Soviet Union has the most extensive woodlands of any country; it is estimated that there are 2,000,000,000 acres in forests, 300,000,000 being in Asiatic Russia. Only 20 per cent of these timber resources are exploited, yet the Soviet Union is first in the world in output of timber and second (after Canada) in its export.

Manufactures. Though, under the old regime, manufactures were stimulated by a high protective tariff on imports, nevertheless, the manufacturing industries were far behind those of the countries of Western Europe. The years of civil war and readjustment brought the inevitable decline in industrial production, and manufacturing had reached a very low point by 1921. Since 1922, however, the trend has been upward, and production is now considerably above the prewar average. Hydroelectric power has been rapidly developed, having a large share in the growth of manufacturing enterprise. Among the plants recently constructed is the hydroelectric Dnieper River plant, with a capacity of 800,000 horsepower, also a number of plants in Transcaucasia, the Volga region, and near Leningrad.

There is no private industrial enterprise in Russia. The Soviet government operates all the large industries of the country. It is no longer the policy of the Soviet government to permit foreign capital to engage in industry,

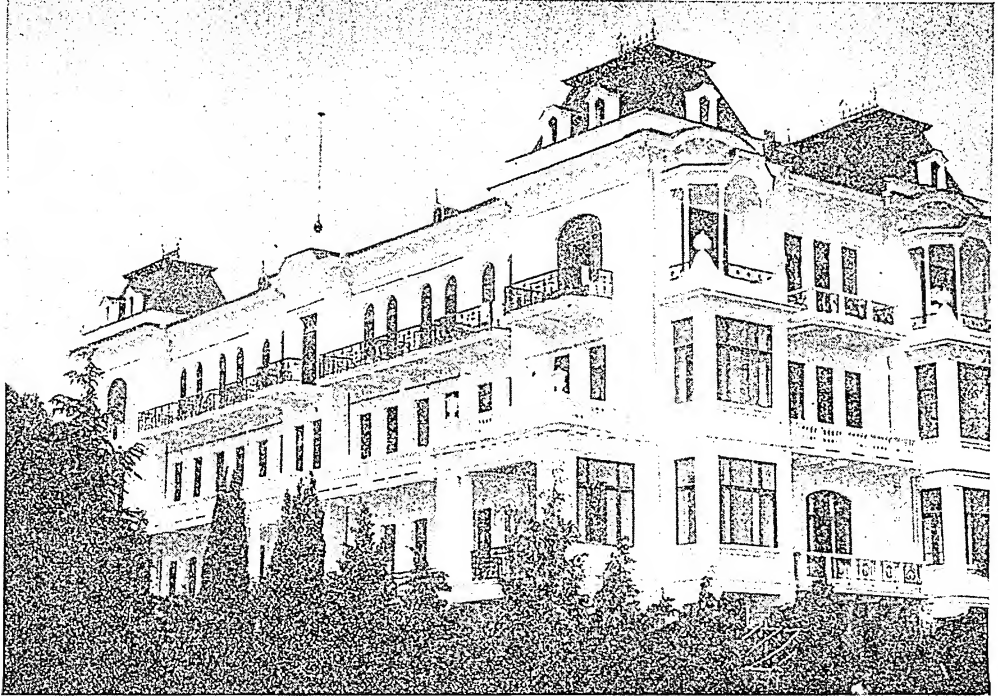
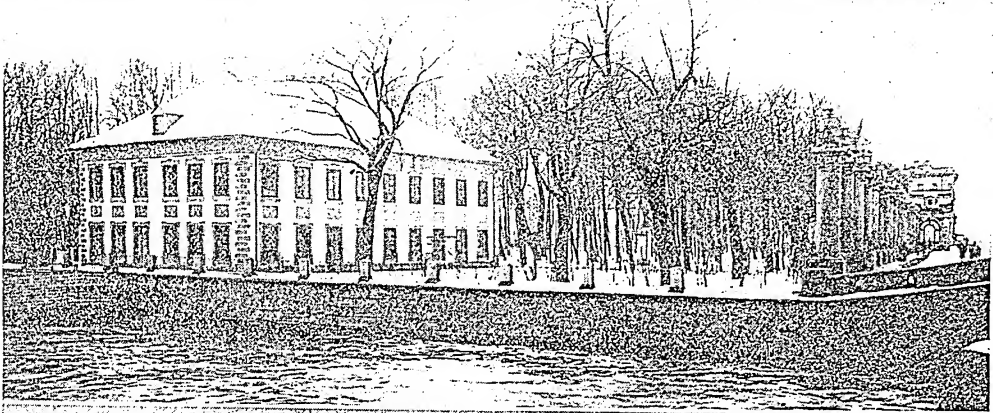
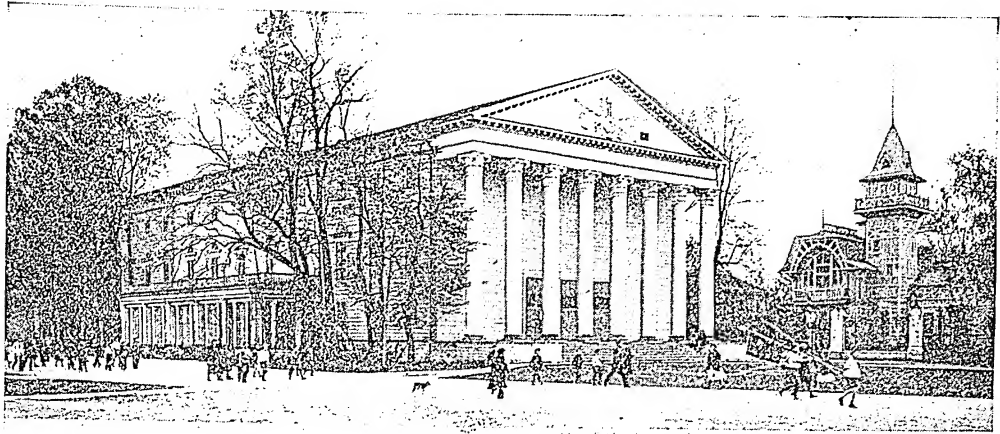


Photo: O R O C

In Soviet Russia. At top, a theater in Leningrad, maintained by the Soviet government for workingmen and their families. Center, house of Peter the Great, in Leningrad; it is now a museum. Below, a sanitarium in the Crimea, for members of the trades-unions.

under special concession agreements, as was the practice before 1931.

The welfare of the worker occupies a prominent place in the industrial program. Shorter hours, rent graded to meet income, vacations of two to four weeks, according to the nature of the work, free medical and sanatorium care, free insurance, four months' absence for childbirth, free nurseries in villages and factories for working mothers, overalls furnished and laundered for factory workers—these are some of the innovations in Russia.

Commerce. Commercially, Russia forms a connecting link between Asia and Europe. To the countries of Western Asia, it is a natural source of supply of manufactured products; to those of Western Europe, it is able to furnish agricultural products and raw material for manufactures. During the revolution, foreign trade almost entirely ceased, but it has been re-established, and is steadily increasing. In Russia, foreign trade is a state monopoly; import and export operations are carried on with special licenses, issued by the Commissariat for Trade to state and co-operative organizations.

The greater part of both wholesale and retail trade is carried on by the state and co-operative organizations. The old-time practice of barter has disappeared from the Soviet Union, and many modern methods are being introduced. An indication of this tendency is the rapid increase in the number of chain stores operated by the co-operatives. Many markets have been established for the sale of food products from state and collective farms. Private trade is virtually non-existent.

Trade between the United States and the Soviet Union (on the basis of purchases and sales) reached a total of \$138,784,323 in 1930 and was \$81,661,000 in 1939. A trade pact concluded between Russia and the United States in 1935 for one year was regularly renewed, but their commerce declined during World War II. The United States buys Russian furs, bristles, wool, hides, flax, hemp, crude drugs, caviar, fish, minerals, and precious metals, and exports to Russia raw materials and a wide variety of manufactured products, including machinery and electrical supplies.

The telegraph and telephone systems have been gradually built up from wartime conditions. Radio, which is controlled by government monopoly, is being modernized with the latest equipment. Since the radio carries on practically all official and commercial communication, especially that with Siberia, increased sending range has become of material value to commercial interests.

Transportation. During all the centuries of its existence, the rivers of Russia have been the great highways of commerce and civilization. It was down the Dnieper that the North-

men descended against Constantinople and brought Greek civilization to Kiev. Nearly all the navigable rivers are connected by canals, and boats can pass from the Caspian and the Black seas to the Baltic. A canal opened in 1934 by the Soviets connects the Baltic and the White seas, and work is being pushed to connect the Black and the Caspian seas. Although the rivers and canals are closed by ice from a fourth to a half of the year, fully one third of the freight is transported by water. The Soviet river fleet is gradually being increased.

The most important seaports are Arkhangelsk, on the White Sea; Murmansk, on the Arctic; Leningrad, Riga, and Tallinn, on the Baltic; Odessa and Novorossisk, on the Black Sea; Astrakhan, on the Caspian; and Vladivostok, on the Pacific. Two thirds of the Russian merchant marine was destroyed during World War I, but by July 1, 1939, it had been rebuilt to 716 vessels of 1,315,766 gross tons.

Russia has nearly 60,000 miles of railway in operation. Moscow is the chief railway center, and the southern half of the country has very good railway facilities, although in construction and equipment, the Russian railways are inferior to those of America. The Trans-Siberian Railway is one of the most extensive systems in the world. Transportation was badly damaged by the war, and was slow in picking up. By 1926 it was back to the prewar basis, except for a shortage of freight cars. The suburban lines about Moscow and Leningrad were electrified, as well as the Suram Mountain Pass section of the Transcaucasian Railway. By 1937 numerous new railroads were completed, particularly in Siberia, Central Asia, and the Ukraine.

During 1925-1926, air transportation was introduced between Moscow and Leningrad; Moscow, Kharkov, and Odessa; Kiev and Rostov; Moscow and Gorky. Air routes have since been established connecting European Russia with the Caucasus, Central Asia, and Siberia. Along the Arctic shores, the Northern Sea Route Administration supplements the brief summer steamer traffic with all-year plane flights. In 1936 the airlines of the Soviet Union, exclusive of the Far North, totaled 48,500 miles, carrying more than 200,000 passengers, 7,500 tons of mail, and a quantity of express freight. In 1937 experimental flights were made to the North Pole, also from Moscow to the United States across the Pole.

Automobile road construction is still in its infancy in Russia, but of late it has made some progress. New highways have been built from Moscow to various points, and also in Central Asia and other regions. In 1936 such hitherto inaccessible mountains as those of Swantia in Central Caucasus were opened to traffic with a highway costing \$2,250,000.

Social Conditions

Society in General. Many conditions have combined to prevent civilization in Russia from advancing as rapidly as it has in the countries of Western Europe. Chief among these causes are the extent of the country, with a consequent diversity of interests; the historic influence of the Mongol invasion and its yoke in the thirteenth to fifteenth centuries; the great number of races represented in the population; a land system which for centuries was exceedingly oppressive to the common people; and a bureaucracy which administered the government in its own interests. Russian society was divided into three classes: (1) the aristocracy, which, until 1861, held almost

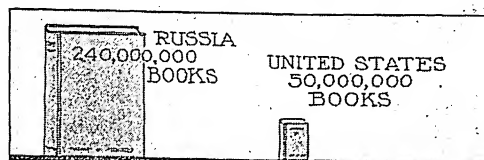
a class by itself and, though nominally owning no property, in reality it owns the state, profiting thereby. They also say that different wage scales have created classes within the Soviet masses; that exploitation of man by man in present-day Russia is merely disguised but not abolished.

Education and Culture. The people of Russia, like those under every other despotic government, have had their struggle for better education. While the wealthy classes enjoyed the greatest privileges of education, the masses were kept in ignorance. Though some progress was made in popular education during the decade before the revolution, a complete system of general education was not established until the Soviets gained control of the government. There are separate commissariats for education in all the constituent republics of the Soviet Union. Thus each nationality is free to develop its own culture. The Commissariat for Education of the R.S.F.S.R., which replaced the former Ministry of Popular Education, includes the Academy of Arts, theaters, educational institutions of specialized types, and municipal schools. One of the principal reforms was the introduction of schools which have three grades, a primary four-year school for children from eight to twelve years, a three-year school for those from twelve to fifteen, and a three-year senior grade for those from fifteen to eighteen. The seven-year school is compulsory for all children of the republic.

For those who at fifteen years of age have completed the seven-year elementary course there is a *technicum*, which is the usual type of Soviet high school combining general education with technical and industrial study. There are also factory apprentice schools and the so-called "workers' faculties." Enrollment in technical schools and workers' faculties in 1938 was 1,200,000; in nurseries and kindergartens, 1,800,000; in schools of all kinds, 33,965,400. Illiteracy was stated to have declined to about 8 per cent of the adult population in 1937.

The enrollment in universities, higher institutes, and academies was about 550,000 in 1938. The course of study in higher schools takes from three to six years, depending on the specialty. Higher scientific research in the Soviet Union is controlled by the Academy of Sciences (which dates back two centuries) and by the newly established Communist Academy.

The circulation of Soviet newspapers in 1939 was 37,500,000 copies, as compared with 2,700,000 in 1913. There is a wide variety of magazines. Russians are among the world's greatest readers of books; in 1933, nearly 44,000 titles were published, and more than 240,000,000 copies are printed every year.



BOOK SALES IN RUSSIA AND THE UNITED STATES

Russians are lovers of literature. They buy nearly five times as many books every year as are marketed in the United States. Few can afford expensive books, so nearly all are printed cheaply, bound in paper covers, and sell at low prices.

absolute sway over the nation; (2) the weak middle class, including professional men, merchants, and other business men, and those peasants who acquired wealth and obtained education; and (3) the ordinary peasantry, constituting by far the largest part of the population, the majority of whom lived in extreme poverty and ignorance. In the cities there were growing numbers of factory workers, underpaid and rebellious.

By 1937, as the result of twenty years of the revolution, this picture was completely changed. The aristocracy had been practically exterminated or had fled abroad. Many of the middle class and the richer peasants had suffered the same fate. A dictatorship of the proletariat (laboring classes) and poorer peasants had been established.

The Soviets claim that their republic is a classless society with every citizen equal; and, since all the means of production belong to the state, with no exploitation of man by man. Even the few representatives of the old aristocracy and former rich property owners have all the rights of citizenship, including suffrage. The constitution of December, 1936, recognizes the right to personal property in restricted categories, also the right of inheritance, but guards against the emergence of a new class of rich individuals.

The opponents of the Soviet regime, however, point to the new bureaucracy ruling Russia. They argue that this bureaucracy is

Theater, opera, concerts, ballet, radio, motion pictures—all these have been greatly developed by the Soviets, both as a means of education and as Communist propaganda.

Until recently, marriage and divorce laws in the Soviet Union were so liberal that unions and dissolutions could be made by mere registration in the proper government office. In 1936, to discourage a "light-minded attitude toward the family and family obligations," higher fees were decreed for divorce-repeaters, and other restrictions were introduced.

Religion. Under the empire, the state religion was the Greco-Russian, or Orthodox Catholic. Until the revolution of 1917, the czar was actually the head of the Church. The Holy Synod was the governing board, and the procurator, its chief officer, had very large

powers. The principal churches and monasteries in Russia possessed rich stores of vestments, some of great antiquity, which were preserved with scrupulous care and used on ceremonial occasions. Perhaps no other institution suffered from the early force of the revolution as greatly as did the church. The Soviets separated church from state as well as from schools. They closed many houses of worship, converting them into museums and clubs, confiscated the riches of the church and abolished monasteries, and deprived clergymen of suffrage and other rights. By the constitution of 1936, freedom of religious belief and exercise is recognized, but on a par with freedom of antireligious propaganda. Clergymen are no longer deprived of the right to vote, and are considered equal citizens in all other respects.

Government of the Union of Soviet Socialist Republics

Previous to the revolution of 1917, the government of Russia was aptly characterized as "a constitutional monarchy under an autocratic czar." Until October 30, 1905, Russia was an absolute monarchy, with the supreme authority vested in the czar. He was assisted by a Council of Ministers, the members of which were appointed by him, and were responsible to him only. In 1905 a constitution providing for an elective assembly was granted (see DUMA). Partial local self-government was provided through the *zemstvo* (which see).

The New Government. After the czar was deposed, an attempt was made to establish a democratic republic under the leadership of Alexander Kerensky. The Bolsheviks, headed by Nikolai Lenin, succeeded in overturning the Kerensky regime in November, 1917, and a Soviet republic was established. (*Soviet* means *council*).

The new constitution of the Union of Soviet Socialist Republics (1936) unites in a single

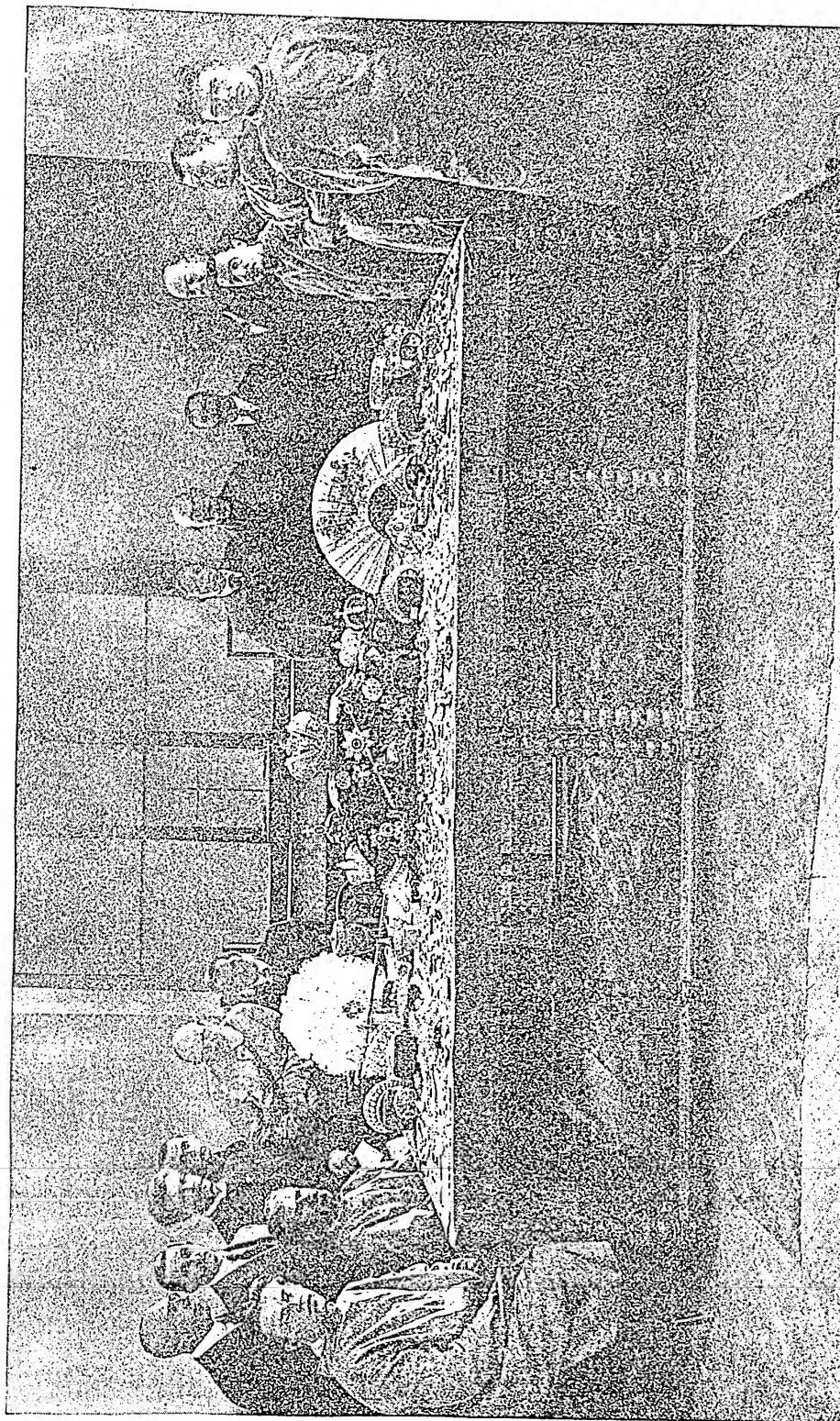
body the sixteen constituent republics, with similar constitutions. The highest organ of authority in the U.S.S.R. is the Supreme Council of the Soviet Union, composed of two chambers—the Council of the Union and the Council of Nationalities, the former representing the population of the federation as a whole and the latter representing the constituent republics and their subdivisions. Jointly these two chambers elect the Presidium and the Council of People's Commissars. The latter corresponds to a Western cabinet and is the government of the U.S.S.R. The Supreme Council meets more frequently than the organ it has displaced, the All-Union Congress of Soviets. It is elected by universal, direct, equal, and secret vote of citizens. The Communist party is still the only political party allowed in the Soviet Union, but the People's Commissars are officially responsible not to this party but to the highest organ of authority, the Supreme Council.

History of Russia, or the U. S. S. R.

Early Period. In the middle of the ninth century, Slavic and Finnish tribes inhabited the forest region around Lake Ilmen, between Lake Ladoga and the upper waters of the Dnieper. The Slavs settled also along the middle course of the Dnieper. In the ninth century, the Northmen spread across the North Sea, some going west to cause trouble in England, and some going across the Baltic and up the Russian rivers, the natural highways. About 850, one of the Northmen or Varangians, Rurik, established a kingdom and consolidated the Slavic tribes around Novgorod. The Finns gave the name of Russ to the Northmen, and the Arabic historians, recording their invasion of the Caspian and Black seas, called them Russians. Intercourse with Constantinople and

the Byzantine civilization left its mark upon Russia, especially when Russia adopted Greek Christianity, in the tenth century.

This Eastern civilization was checked when the Mongols swept over Northern Asia in the thirteenth century. Genghis Khan overran Russia and made the Christian princes vassals. Among these princes, the Grand Duke of Moscow became the most powerful and the favorite of the Khan of the Golden Horde. In the fifteenth century, Ivan III of Moscow threw off the Mongol rule, overcame the republic of Novgorod, and laid the foundations of the Russian state. In the sixteenth century, Ivan IV, also known as the Terrible, conquered the Kazan and Astrakhan kingdoms of Tatars, and soon after his Cossacks invaded



The Fabulously Rich Crown Jewels of the Czar of All the Russias. When the Bolsheviks came into power, the crown jewels of the late royal family were confiscated by the Soviet government. At one time, they were reported as sold to a syndicate, to be broken up and disposed of, but accredited reports say they are preserved in vaults in the state bank. The czar's crown (center, background) is said to be valued at \$52,000,000.

Photo: Wide World

and occupied the extensive region of Siberia.

In 1598 this line of czars became extinct, and there began a period of civil and foreign wars, or the Time of Troubles. In 1613 nobles and Cossacks elected to the throne the first Romanov, Michael Feodorovich.

Beginning of Modern Russia. Peter the Great, Michael's grandson, was the first emperor of Russia. His reign (1689-1725) was a period of great reforms. He introduced into the government many of the ideas and methods of the more progressive nations of Western Europe, founded Saint Petersburg (now Leningrad), inaugurated shipbuilding and advanced other industries, and in many ways welded his vast domain into a strong, centralized power. Some of Peter's ideas were strenuously opposed by the nobility, and for a brief period after his death, the movements he had begun languished. However, under Catharine II (1762-1796), Russia again made advancement, and was fully recognized as a great power. It was during her reign that Poland was partitioned, and 180,000 square miles of territory with 6,000,000 inhabitants were added to Russia. Two successful wars were waged against the Turks, who were compelled to release their control over the Crimea and other possessions in what is now the Ukraine.

Under Alexander I, serfdom was abolished in the Baltic provinces, although no land was given to the freed peasants (see *SERFS*), and a number of improvements in the government were made. He joined Austria against Napoleon, but their combined armies were defeated at Austerlitz. Later, Alexander entered into an agreement with Napoleon whereby he acquired Finland and the Aland Islands from Sweden, and compelled Turkey to cede to Russia the territory between the Dniester and the Pruth. In 1812, however, Alexander joined Great Britain against Napoleon, whose overthrow he was largely influential in accomplishing. At the Congress of Vienna, the Duchy of Warsaw was ceded to Russia. During the reign of Alexander's successor, Nicholas I, who ascended the throne in 1825, Russia extended its dominions in Asia, and began the conquest of the Caucasus. In 1854 Nicholas began a war against Turkey which led to the interference of France and Great Britain, and Russia was compelled to relinquish most of the advantage it had gained through its victories.

Abolition of Serfdom. Alexander II was noted for his abolition of serfdom throughout the empire, in 1861, whereby he set free more than 40,000,000 people, but on conditions very unfavorable to these peasants. In 1864 the zemstvos were instituted. But because of the insufficiency of these reforms, there was a growing spirit of unrest throughout the coun-

try. This led to the increase of government espionage and the issuing of orders which restricted the freedom of speech and of the press. Many political suspects were arrested and transported to Siberia. In 1877 war was again declared against Turkey. In less than a year, the Russian forces had advanced almost to Constantinople, when the other European powers intervened and again deprived Russia of its long-coveted prize, leadership in the Balkans. On March 13, 1881, Alexander II was assassinated in Saint Petersburg by revolutionary conspirators.

Alexander III, who succeeded to the throne in 1881, was noted for his extreme reactionary policy. During his reign, Russian dominions in Asia were extended; the persecution of the Jews became so cruel as to call for protests from other nations; the Trans-Siberian Railway was begun; and an alliance was formed with France.

History to World War I. Alexander III died in 1894, and was succeeded by his son, Nicholas II, who was deposed in 1917. The new czar had imperialistic plans for expansion in the Far East. The Trans-Siberian Railway was completed, and other important lines in Asia were constructed. At the close of the war between China and Japan, in 1895, Russia secured from China the lease of Kwangtung Peninsula for twenty-five years. This was made into a province, the port of Dalny was opened, and a strong naval station was established at Port Arthur.

Another treaty with China provided for the construction of the Manchurian Railway, and under pretense of guarding the railway (known as the Chinese Eastern), Russia assumed military occupation of Manchuria. These measures had been strenuously opposed by Japan, and in 1904 that country declared war against Russia. In the conflict, which lasted about a year, Russia was disastrously defeated, and forced to withdraw from Manchuria and Korea.

But of far greater significance than the war were the social and political movements within the empire, to which the war gave a strong incentive. For more than a century, there had been almost constant friction between the aristocracy and the people. The strained relations occasionally led to riots. These disturbances were quelled by the police or the army, and the leaders were usually executed; nevertheless, the liberal and radical spirit continued to increase.

The people realized that Russia's defeat in the war with Japan was the result of the inefficiency and corruption of the bureaucracy, which the czar was unable and apparently unwilling to control. In addition to this, the government had refused to grant relief from an intolerable land system, under which the people of some sections were starving in a

land whose crops were feeding the nations of Western Europe. Moreover, the great railways within the empire had been built with foreign capital, and foreign capital had also found that certain Russian industries offered a desirable field for investment. With the growth of capitalism in the empire, a labor class developed, forming the nucleus of a great party of protest.

Within the government the extreme conservatives constantly advocated more drastic measures of repression. Petition after petition was denied, until the tension between the government and the people reached the breaking point. Then came the revolution of 1905, inaugurated by a series of great strikes. In January, workers and their families marching to the Winter Palace with a petition addressed to the czar were fired on by the police and the soldiers. Over 500 innocent people, many of them women and children, were killed, and over 3,000 were wounded. In history this became known as the Bloody Sunday. The best political authorities of Russia agree that by this act the government alienated itself from the people beyond all possibility of compromise or reconciliation.

The ruling power finally realized that it was unable to control the situation by repressive measures, so the czar reluctantly granted a constitution providing for a national assembly, the Duma, elected by the people. Such restrictions, however, were thrown about this assembly that it could accomplish little in the way of direct legislation. The czar reserved the power to dissolve it at will, a power which he promptly exercised whenever the assembly acted contrary to the wishes of the bureaucracy. The first Duma met May 10,

1906. It recommended universal suffrage, the abolition of the Council of the Empire, and reform in the land laws. This Duma was dissolved July 22. Successive Dumas passed important laws regarding popular education, national defense, and peasant conditions, and the influence of this national assembly continued to be felt throughout the empire; furthermore, the oppressive measures of the bureaucracy met with more strenuous opposition from year to year. Democracy was increasing and bureaucracy tried to stifle it. Matters approached a crisis which was, however, postponed by the entrance of Russia into the great European war, as one of the Entente members. (For Russia's part in the war, see WORLD WAR I).

The Revolution of 1917. While the revolution came with the suddenness of a shock, it was the climax of many years of preparation, characterized chiefly by the evolution of democracy. The inefficiency and corruption of the czar's ministers and generals during the World War cost the people needless sacrifices in lives and economic well-being,

and thus quickened and deepened the desire for radical change.

The revolution broke out in Petrograd (now Leningrad) during a sharp shortage of food, in the early spring of 1917. The army was also disaffected. Instead of shooting at the workers as they did in 1905, the soldiers joined the revolution. The czar's ministers were removed from their offices, and some were imprisoned. The czar was at last willing to compromise, but it was too late. His abdication was demanded. In March, sitting in a railroad car, Nicholas II abdicated in favor of his brother, Grand Duke Michael, who promptly declined the throne, leaving the final decision

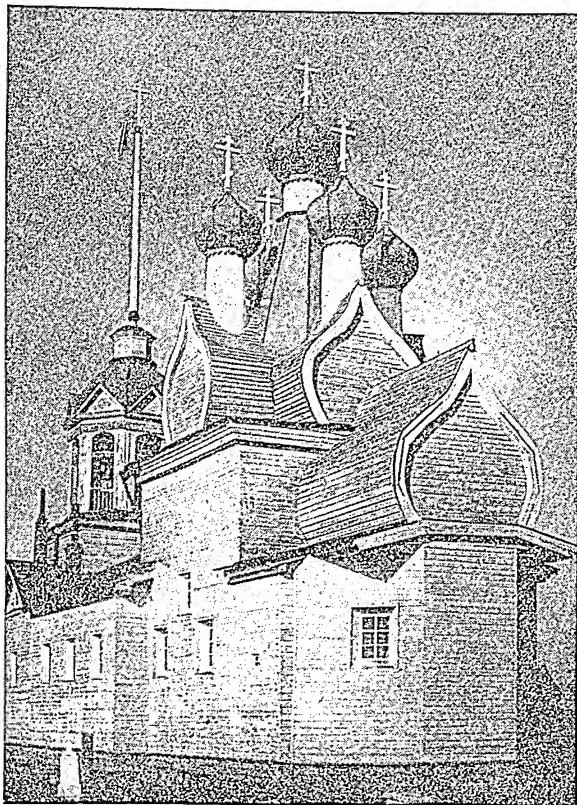


Photo: O R O C

CHURCH ARCHITECTURE

Typical style employed in the construction of Greek Orthodox churches in Russia.

to the will of the people. The Romanovs ceased to reign. Russia became a republic (officially proclaimed in September, 1917).

A provisional government was formed, first under Prince Lvov, a liberal known for his work

offensive against the German and Austrian troops, but this ended in a complete rout of the Russian soldiers who no longer wanted to fight. It constantly postponed the calling of the Constituent Assembly. In the matter of land it was equally indecisive, and peasants began to seize the property of landlords. In the cities disorders also broke out. Throughout the summer and early fall of 1917 chaos was on the increase.

Finally, early in November, a Bolshevik-guided revolt of workers, soldiers, and sailors broke out in Petrograd. The Winter Palace was stormed, and the Kerensky government was overthrown. A number of its ministers were arrested, but Kerensky himself succeeded in his flight. A Soviet government was formed, with Lenin and Trotzky at the head. The All-Russian Congress of Soviets, then meeting in Petrograd, confirmed the new regime. After a brief spell of street fighting, Moscow also went over to the new power. The provinces (with but a few exceptions) followed the Lenin leadership.

Russia under Bolshevism. Decrees were issued placing the workmen in control of the factories; private ownership of land was abolished; and mines, forests, and waterways were taken over by the state. After an unsuccessful attempt to have the Allies meet the Germans in a peace conference, Lenin sent envoys to Brest-Litovsk. They signed there, on March 3, 1918, a treaty which took from Russia one thirtieth of its territory and one fifth of its population. Russia agreed to relinquish its sovereignty over Estonia, Livonia, Courland, Finland, Poland, and the Ukraine; to release all German prisoners; and to pay huge indemnities. The Soviet Congress ratified the treaty in the city of Moscow, which had been made the Russian capital, but Germany's defeat in November, 1918, caused the nullification of the entire agreement. Meanwhile, on July 16, 1918, the deposed czar, Nicholas II, and all of his family and several retainers had been executed in their Siberian prison by soldiers of a local soviet.

Though Russia had won a peace with Germany, civil war soon was raging on all sides. A powerful anti-Bolshevik faction in Siberia, aided by Czechoslovakian troops, set up a "White" government at Omsk, which the well-organized "Red" army defeated. Another strong anti-Bolshevik center, in South Russia, was eventually brought under Soviet control. In fact, wherever so-called White governments were set up, they were overthrown by the revolutionary army, and when, finally, allied support was withdrawn, the movement collapsed. By 1920 the old Russian frontiers were practically under control of the Soviet government. Meanwhile, Russia made boundary agreements with Estonia, Lithuania, Latvia,



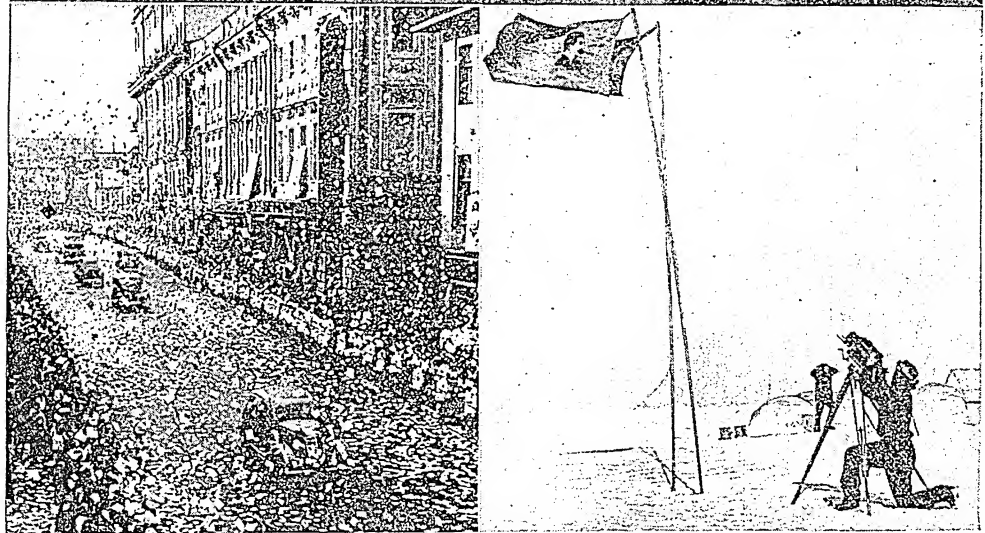
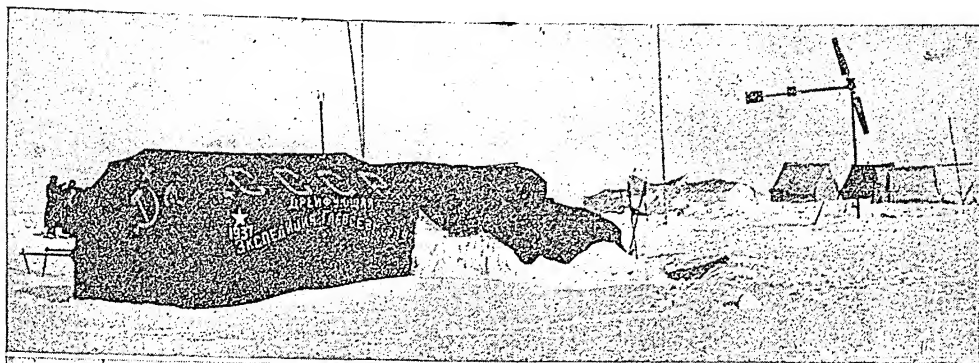
Photo: Sovfoto

SOVIET FARM LABORATORY

A Russian girl farmer of the Chuvash republic analyzes wheat seed. In thousands of such farm laboratories in the Soviet Union, scientists carry on selection work, analyze seed, and introduce modern methods of agriculture to once backward Russian farmers.

in the zemstvos; later under Alexander Kerensky, a socialist of moderate views. Everywhere soviets sprang up. In April, Nikolai Lenin returned from exile. Led by Lenin, the left wing of the Social-Democratic party, the Bolsheviks, soon dominated the soviets. Another returned exile, Leon Trotzky, co-operated with Lenin.

The Bolsheviks realized that the people as a whole were tired of the war, that the peasants wanted land, and the workers desired better living conditions. They proclaimed the slogans, "Peace without annexations and contributions," "Land for the peasants," and later, "Peace to the huts, war against the palaces." The Kerensky government, instead of taking measures toward peace, ordered an



Photos: Acme

Russia Plants Its Flag at the North Pole. (From top) First "permanent" camp established by Soviet North Pole Expedition. The sign on the tent reads "U.S.S.R. The Drifting Expedition of the Chief Administration of the Northern Sea Route 1937." The group to stay a year at the Pole: (left to right) E. T. Krenkel, radio operator; I. D. Papanin, head of group; E. N. Fedorov, magnetologist and astronomer; P. P. Shirshov, hydrobiologist. Moscow welcoming returning members of the Soviet North Pole Expedition. Photographing Russian flags at North Pole; one flag bears the portrait of Stalin.

OUTLINE AND QUESTIONS ON RUSSIA

Outline

(Outline and questions refer chiefly to European Russia.)

I. Location and Size

- (1) Wide extent of the U. S. S. R.
- (2) Area
 - (a) Great Russia
 - (b) Ukraine
 - (c) White Russia
 - (d) Georgia
 - (e) Armenia
 - (f) Azerbaidzhan
 - (g) Turkoman
 - (h) Uzbek
 - (i) Tadzhik
 - (j) Kazakstan
 - (k) Kirghiz

II. The People and Cities

- (1) Population
- (2) Racial groups
- (3) Characteristics
- (4) Principal cities

III. Surface Features

- (1) Part of great plain of Europe
 - (a) Greatest height
 - (b) Heights of the Volga
 - (c) Caspian Sea basin
- (2) Ural Mountains
- (3) Caucasus Mountains
- (4) Yaila Mountains

IV. Drainage

- (1) Rivers
 - (a) Arctic system
 - (b) Baltic Sea system
 - (c) Black Sea system
 - (d) Caspian Sea system
 1. The Volga
 2. The Ural
- (2) Lakes
 - (a) Ladoga
 - (b) Onega

V. Climate

- (1) Differences in temperature due to latitude very gradual
- (2) Effect of absence of lofty mountain ranges
- (3) Continental climate
- (4) Rainfall
- (5) Snow
- (6) Length of days

VI. Plant and Animal Life

- (1) Arctic zone of vegetation
- (2) Evergreen forest belt
- (3) Hardwood forest belt
- (4) The steppes
- (5) Fur-bearing animals
- (6) Smaller animals
- (7) Birds
- (8) Fish

VII. Resources and Industries

- (1) Mining
 - (a) Of iron and coal
 - (b) Importance of platinum and manganese
 - (c) Oil
 - (d) Other minerals
- (2) Fishing
- (3) Agriculture
 - (a) Chief occupation
 - (b) New system of landholding
 - (c) Methods
 - (d) Chief crops
- (4) Manufacturing
 - (a) Under the czars
 - (b) Changes under the Soviets
 - (c) Hydroelectric power

VIII. Commerce and Transportation

- (1) Russia as connecting link between Europe and Asia
- (2) Effect of early lack of transportation facilities
- (3) Water transportation
- (4) Railway mileage
- (5) Roads
- (6) Airplanes

IX. Social Conditions

- (1) Classes
- (2) Education
- (3) Culture
- (4) Religion

X. Government

- (1) Historic phases
 - (a) Autocracy
 - (b) Establishment of Duma
- (2) Government since revolution of 1917

XI. History

- (1) Early years
- (2) Establishment of modern Russia
- (3) The Napoleonic period
- (4) Continued autocracy
- (5) Abolition of serfdom
- (6) Russo-Turkish Wars
- (7) Recent growth
- (8) Russo-Japanese War
- (9) Russia and the World War
- (10) The revolution of 1917
- (11) The rule of the Soviets
 - (a) Treaty of Brest-Litovsk
 - (b) New Economic Policy
 - (c) Lenin and Trotsky; Trotsky and Stalin
 - (d) Five-year plans
 - (e) The constitution of 1936

OUTLINE AND QUESTIONS ON RUSSIA—Continued

Questions

What was the meaning of the "N. E. P." in recent Russian history, and how did it affect trade and industry?

Why were not the provisions of the treaty of Brest-Litovsk (1918) carried out?

How was the last czar of Russia disposed of by the Bolsheviks, and what was the fate of his family?

When was the name of Russia changed, and what is now the official designation of the country?

What was the present religion of the Russians, and how is all religion regarded by the Soviet state?

When did the United States government enter into diplomatic relations with the present government of Russia?

What leader of the revolution of 1917 was expelled from Russia?

Where is the largest area below sea level in the world? How much below sea level is it, on the average?

How does the heavy snowfall benefit Russia?

Where is Russia's great wheat-producing region?

If the United States had the same railway mileage in comparison with its area as Russia has, how many miles of railway would it have?

Of what great physical region of Europe does Russia form a part?

How do you account for the fact that the climate of Russia varies so gradually throughout the great north-and-south extent of the country?

When did the first legislative assembly of Russia meet? What was it called? What limitations were placed upon its power?

What is the position of the Communist party in Russia?

What is the "mother" river of Russia? How does this stream rank as to size among the rivers of Europe?

Why should Russia have larger rivers than any other country of Europe?

What distinction as to size has Russia's largest lake among the lakes of the continent? How does it compare in area with the largest North American lake?

How long is the longest summer day in Leningrad?

What are the steppes, and how has the advance of civilization changed their appearance?

What change has there been in the system of land tenure?

How many countries have a greater forest area than has Russia?

How do methods of manufacture differ from those employed in most other countries of Europe?

How has Russia's geographic position made the country of importance commercially?

What was the importance of Peter the Great in Russian history?

Who were the serfs, and when and by whom were they liberated?

What slogans were used by the Bolsheviks to win the support of the people?

Describe the Soviet system.

What was Lenin's attitude toward the privileged classes?

Why did civil war follow the revolution?

Is there a classless society in Russia?

Where are Russia's richest oil deposits?

What were the Moscow trials of 1936-1937?

By what great contrasts in animal and plant life are the extreme north and the far south of Russia characterized?

Name the principal mineral areas of Russia.

What is being done in Russia to put farming on a modern basis?

What were the five-year plans?

Finland, and Poland. With the latter country there was a brief war over the frontier question (see POLAND [History]).

The years 1920 and 1921 were extremely difficult for the new regime, because of the utter demoralization of transport and industrial systems, and the acute discomfort of the impoverished people. In 1921 famine swept over great sections which normally produce abundant crops of grain, and thousands died of starvation and disease. That same year, however, witnessed the inauguration of the New Economic Policy (N. E. P.), which virtually restored a degree of private initiative in trade and industry.

In 1924 Lenin died and a struggle between Trotsky and Stalin developed. Stalin was the secretary-general of the Communist party who believed that it was possible to build socialism in one country, without waiting for an international revolution for which Trotsky hoped and worked. Stalin proved to be a better statesman and politician, outwitting his rival completely. In 1927 Trotsky was exiled to Central Asia, and two years later he was expelled from the Soviet Union.

The economic basis of the country improved and the New Economic Policy was gradually abandoned. To build socialism and to create a modern industrial country of total self-sufficiency, the first Five-Year Plan was inaugurated in 1928. With machinery and methods largely imported from the United States, heavy industries were expanded or built anew.

After October, 1929, Saturday and Sunday, with the significance that attaches to them in the United States as a half-holiday and a day of rest, disappeared from the Russian calendar. An uninterrupted week for industry was decreed by the Council of People's Commissars. The new rule required four workdays of seven hours each, and provided for rest and recreation on each fifth day. Offices and plants were open continuously, so that one fifth of the personnel enjoyed a day of rest every day in the week. The conventional custom of everybody being free on the same day was abolished in most industries. However, the six- and even seven-day week with one day of rest was retained in many occupations, and in 1940, Russia was forced to return entirely to the seven-day week.

In 1933 the second Five-Year Plan was started. Emphasis was placed on the *light* industries, such as the production of textiles, clothing, and all articles of immediate use to the people. Production technique and quality were sought rather than mere quantity. The so-called Stakhanov movement was inaugurated to speed up production by super-efficiency, the workers receiving high bonuses for inventiveness and elimination of waste. The progress made in both manufacturing and agriculture made it possible to abolish "bread cards" and

the various other forms of rationing in 1935.

The long list of great powers recognizing the Soviet government was completed when the United States resumed diplomatic relations with Russia in November, 1933. The Soviet Union's foreign relations were further improved by its entry into the League of Nations in 1934 and the apparent settlement of the Chinese Eastern Railway question in 1935, through the sale of the railroad to Japan. The common threat from Hitler led in 1935 to the conclusion of mutual assistance pacts between the governments of Russia, France, and Czechoslovakia.

The civil war in Spain in 1936-1939 heightened the menace of a new world war with Russia as a chief target of Nazi and Fascist designs. In Moscow there were trials and executions of Trotskyites, accused of plots against Stalin, and of prominent Reds, charged with high treason. These events showed the extent of tension under which new Russia still labored.

Internal Developments

The increasing tension in international relations and the outbreak of war, first in eastern and then in central Europe, brought the Soviet Union back to Europe, from which the Munich settlement of 1938 tried to isolate it. Also in the Far East its role became increasingly important with the continuation of undeclared wars in Asia. The internal developments for the year 1939 within the Soviet system, however, pointed to greater stability. There was, in fact, a spread of Sovietism westward with the collapse of Poland, and an increase of Soviet influence in both Baltic and Balkan areas, brought about by force in the case of Finland.

The Purge. The ruthless methods of handling alleged conspirators and so-called wreckers in 1937-1938 were not only abandoned but officially condemned at the Party Congress held in March, 1939. It was admitted that there had been gross overreaching, and efforts were made to repair some of the damage done. The morale of the whole system had suffered. Much of the harm done could not be remedied, and the overreaching in the methods of the purge remained another illustration of the terrific cost of the absence of adequate controls in this revolutionary system of the Soviets. However, the purge had had a constructive side in that it protected the Soviet Union from the intrigues and promotion of treasonable activities practiced more and more by the Nazis and the Japanese. Also, as a result of the elimination of many incompetents, as part of the purge in its nonviolent form, new and younger elements trained during the twenty-two years of revolutionary Sovietism rose to leadership in economic as well as political posts.

Economic Conditions. With its totalitarian



Photo: Acme

SOVIET BORDER OUTPOST GUARDING THE LONGEST FRONTIER IN EUROPE

Accompanied by a service dog, these two soldiers, dressed in white to make them almost invisible against the snow, patrol a lonely section.

character, the Soviet system can be judged to a very large extent by the economic status and morale of the people. Under both the czarist and Soviet regimes, the standard of living of the Russian people remained much lower than in most of the other countries of the world peopled by the white race. During the period 1934-1936, some improvement in the general welfare of the Russians became apparent as a result of widespread industrialization. The production of food, clothing, and other articles used by the average man fell off again during the years 1936-1938, while Stalin was carrying out his ruthless extermination of political opponents. With the development of the European crisis in 1939, the Soviet Government felt obliged to concentrate upon the production of armaments at the further expense of the consumers. Thirty-eight per cent of the total Soviet budget of 40,885,000,000 rubles in 1939 represented defense expenditures. American correspondents leaving Russia early in 1941 reported a scarcity of almost all foods except bread, that shoes and clothing were virtually unobtainable, that the housing shortage remained acute despite much building activity, and that prices and hours of labor and taxation were rising, while incomes remained stationary.

On the question of morale, while the new attitude toward work has not come as rapidly as the leaders expected, to judge from their own

statements, many outside students have noted greater changes in attitude than they had expected. It was found necessary to introduce "work books" for factory workers in December, 1938, in the interest of greater "labor discipline." This measure meant a certain increase of regimentation, but the Soviet leaders insisted that it was directly against only a disruptive element, representing a small minority. In agriculture new laws introduced in May and August of 1939 brought stricter regulation of work within the collective farms also. With respect to this legislation, the official Soviet explanation was that it would affect only a small number within each unit, and stop these from practices which could be called "racketeering" and "chiseling" to use the American terms. The reaction to these measures, as expressed in the way workmen and peasants work under them, will determine the correctness of the official explanation. Some outside critics have seen in these measures evidence of the inherent weakness of the whole Soviet socialist system, in that it required, even in its twenty-first year, an increase rather than a decrease in disciplinary measures forcefully imposed from above.

The Party Congress. An All-Union congress of the Party convened in March, 1939. This was the first congress since 1934, and Party congresses are more authoritative even than Soviet congresses because of the "ruling" position of

the Party (Communist party of Bolsheviks) in the Soviet political-economic structure. The congress registered the process of the revolution in eliminating hostile or even antagonistic classes by abolishing the former regulation giving factory workers, as opposed to office workers and peasants, preference and easier conditions in joining the Party. But the Party remained still a closed organization with very strict requirements demanded of candidates applying for membership. This has always been the peculiar feature of this special type of organization to which our Western word "party" has been applied. However, admission to the Party has become easier, a larger percentage joined in 1939, and the total membership with candidates increased to over 3,000,000. The Party has therefore again, as before the purge, widened its base, although it has not flattened itself into the masses. But more and more so-called non-Party Bolsheviks have come up into positions of responsibility, especially in economic enterprises. Also, in the Soviet elections of 1939, as in previous elections of 1937 and 1938, the official aim was a bloc or close co-operation between Party and non-Party candidates, the number of the former greatly exceeding that of the latter, however.

Soviet Elections. Under the new constitution of December, 1936, providing for universal and equal suffrage with direct vote by secret ballot, the first elections were held only at the end of 1937 and then only for the Supreme Soviet of the whole Union. In 1938 the supreme soviets of the eleven constituent republics of the Union were elected. In late 1939, the regional, district urban and village soviets held elections of over a million deputies to the primary and intermediary units of this single, pyramid-formed structure. The election commissioners of a given election district, which select the candidate, include by law representatives of all Soviet economic, social, and cultural organizations as well as representatives of the Party.

The pattern of elections is quite different from the American, and with several positive features to be noted. The Soviet deputy continues at his production job, and Soviet writers point to this feature as giving direct rather than secondary representation of group interests. The sessions of the central supreme soviets of the Union and its component republics, have as a rule been short, though frequent. These sessions give the impression of mass meetings at which the leaders report, although debate and discussions are becoming more extensive and detailed. Thus a Soviet type of parliament is being evolved, which may in time produce an institution exercising more effective control. The people of the Soviet system are being gradually introduced to the practices of self-government and self-administration.

The Soviet Union and World War II

The policy of the Soviet Union toward the great struggle that broke out in Europe in 1939 presents a riddle to many foreign observers. To understand this policy it is essential to recall that Lenin and his disciples have always contended that the Soviet Union and the capitalist states are in fundamental opposition, and that sooner or later one or the other of these two systems must prevail. An invasion of Russia by the capitalist powers has been the bugbear of Soviet statesmen ever since the Allied countries intervened against the Bolshevik regime at the end of World War I. During the first decade of the postwar period, Lenin and his successors were mainly concerned with the danger of an attack by the victors in World War I, namely Great Britain and France, with the possible assistance of Japan. Throughout this period Soviet foreign policy sought above all to prevent the formation of an anti-Soviet alliance between the Allied Powers. The support of liberals and Communist sympathizers in the democratic states was also enlisted in this struggle. This explains why the Communist International, under instructions from Soviet leaders in Moscow, ordered Communist parties throughout the non-Soviet world to support a policy of pacifism and disarmament.

However, with the rise of Hitler in Germany and the commencement of German rearmament on a grand scale, the Soviet leaders began to fear an attack from the Fascist countries more than from the democratic powers. In 1935, therefore, Soviet foreign policy, and with it the Communist party line throughout the world, underwent a marked change. For the former slogans of pacifism, disarmament, and anti-imperialism was substituted the demand for "collective security" and resistance to Fascism. A campaign to enlist middle-class liberals and other anti-Communist elements in this world program was pushed with considerable success. Russia entered the League of Nations and played a leading role in efforts to mobilize the non-Fascist states against the rising threat from Germany and its allies.

The collaboration between the Soviet Union and the democratic powers during this period was marked by deep-seated suspicion of one another's motives. The democratic states believed that Russia was using the League and the campaign against Fascism as a means of extending Communist influence. Soviet statesmen, on the other hand, questioned the sincerity of the leaders of the British and French governments in their resistance to the Fascist powers. They believed that the democratic statesmen were only interested in diverting German and Italian expansionist ambitions toward Russia.

This suspicion was deepened as a result of the capitulation of Britain and France to Germany at the Munich Conference in September, 1938.

After the Russians were excluded from the Munich negotiations, they abandoned their professed policy of blocking the aggressions of Fascist powers and began to play a lone hand in the European diplomatic game.

British-French-Soviet Negotiations. When Hitler, in violation of his pledges at Munich, established a protectorate over Czechoslovakia in March, 1939, the British and French governments again sought to enlist the Soviet Union in an anti-German bloc. They agreed to aid Poland, Rumania, Turkey, and Greece, if these states were attacked by Germany, and they urged the Soviet Union to offer similar guarantees. However, Stalin and his aides insisted upon a joint Anglo-French-Soviet guarantee of the neutrality and independence of the little Baltic states and Finland as the price of Russian collaboration. The Baltic states and Finland vigorously objected to this proposal, fearing that it was merely a pretext for establishing Soviet domination over their countries. According to the British, Moscow secretly proposed an alliance with Britain and France in return for a free hand in the Baltic states and the right to establish military bases there and in the Åland Islands. The British and French refused to conclude any agreement of this nature against the wishes of the Baltic republics and Finland.

The German-Russian Nonaggression Pact. The negotiations dragged out from April to August, 1939, and then suddenly collapsed with the announcement on August 22 that Russia and Germany had agreed to conclude a pact of nonaggression. By this pact, which was signed in Moscow on August 24 by the German and Soviet foreign ministers, both governments bound themselves during a period of ten years to settle all their disputes peaceably by direct discussion or arbitration. They also agreed to give no support to any warlike measures of a third power against the other party.

This agreement was one of the most sensational events in modern diplomatic history. It paved the way for the German attack upon Poland on September 1. Since Britain and France kept their pledges and went to Poland's aid, it fulfilled the major objective of Soviet policy—to remain neutral while the anti-Communist powers weakened themselves by war. On September 17, while the Poles were engaged in a last-ditch resistance to the Germans, the Red Army invaded Poland without warning. This ended Polish hopes of continuing resistance to the Germans in the marshes of eastern Poland, and resulted in the division of Poland between Germany and Russia. The Soviet Union acquired about 77,703 square miles with a population of about 12,000,000. This territory was formally annexed to the Ukrainian and White Russian Soviet Socialist Republics on November 3, 1939.

Meanwhile, on orders from Moscow, the Communist parties throughout the world adopted a new line of policy immediately after the conclusion of the German-Russian pact. They abandoned their previous hostility toward aggressors and their advocacy of collective security and resistance to Fascism. Instead they joined with the Nazis in attributing the war to the imperialist motives of France and Britain. Communists and their sympathizers in all the democratic countries urged peace with Germany and opposed all support to the allied cause.

Annexation of Baltic States. It became apparent before long that Hitler had agreed to give Russia, in the Baltic states and Finland, the free hand that had been refused by the British and French. Between September 28 and October 10, 1939, Estonia, Latvia, and Lithuania were forced by the threat of immediate invasion to conclude treaties of mutual assistance with the Soviet Union, giving the Russians naval, air, and military bases in these Baltic states.

In each case the mutual assistance pact contained a promise that it would not disturb "the sovereign rights of the contracting parties, in particular their economic systems and state organizations." But less than a year later, in July, 1940, Soviet troops invaded the three countries. Their independent governments were ousted. After leaders of opposition elements had been arrested or had fled the country, Soviet-controlled parliaments were established and the three countries voted to enter the U.S.S.R. The Soviet Union accepted their petitions for incorporation by decrees of August 3, 5, and 6.

Russo-Finnish War. In October, 1939, immediately after the conclusion of the mutual assistance pacts with the Baltic states, the Russians made similar demands upon Finland. They asked for a pact of mutual assistance, for territorial cessions, and for the right to establish naval and air bases in Finland. The Finns agreed to make some territorial concessions but refused the more far-reaching of the Soviet demands. Accusing the Finns of aggressive aims against Russia, the Soviet forces launched an attack upon them on November 30.

A bloody war ensued along the Russo-Finnish frontier during the bitter cold of the winter of 1939-1940. The Finns inflicted defeat after defeat upon invading columns of Russians, but in February and March, 1940, a strong Soviet offensive managed to break through Finland's Mannerheim Line defenses on the Karelian isthmus. The exhausted Finns then sued for peace, and on March 12 a treaty was signed at Moscow giving Russia more concessions than had been originally demanded (see FINLAND). By a Soviet decree of March 31, 1940, most of the territory ceded by Finland

was incorporated in the Karelo-Finnish Soviet Socialist Republic.

The Soviet-Finnish peace treaty was followed by increasing Russian pressure upon the Finns, who lived in fear of another Soviet attack that would complete the subjugation of their country.

Annexations from Rumania. Although Germany gave Russia a free hand in the Baltic states, the two countries found their interests increasingly antagonistic in the Balkans. Russian hopes for a long drawn-out war between Germany and the Allies were upset by the Nazi victories in the Low Countries and France in May and June, 1940. This freed a large part of the German army for operations in eastern Europe and the Balkans. Apparently fearing that Britain might soon collapse and leave Germany undisputed master of Europe, the Soviet Government, immediately after the signing of the Franco-German Armistice, presented an ultimatum to Rumania, demanding Bessarabia and Northern Bucovina. King Carol's Government yielded on June 28 and on July 1 Russian troops marched in. The territories taken from Rumania added an area of 18,883 square miles and a population of about 3,700,000 to the Soviet Union.

Russo-German War. The threat of further Russian aggressions led Rumania to accept German protection and made Finland anxious for German military support. Meanwhile Russia and Germany intensified their rivalry over Bulgaria and Yugoslavia. Germany won this struggle in the spring of 1941, when Bulgaria joined the Axis, and Yugoslavia and Greece were crushed by German armies.

Having defeated France and driven Britain from the continent with the indirect assistance of Moscow, Nazi Germany was free to attack the Soviet Union with most of its armed forces. Before invading Britain or the Near East, Hitler wanted to end the danger of a Russian attack upon Germany's rear. He also needed Russian food, oil, and other resources to balk the British blockade. Expecting a quick victory, the Germans on June 22, 1941, attacked along the entire Russian frontier from the Arctic to the Black Seas. The German forces were assisted by the Rumanians, Hungarians, Slovaks, and later by the Finns and Italians. The progress of the Axis armies, after penetrating deeply into western Russia, was impeded by the fierce resistance of the Red Army, the onset of a severe winter, and the surprise counter-offensive staged by General Timoshenko.

The guiding spirit behind the Russian defense was Joseph Stalin, dictator of the Soviet republics since 1927. Upon the outbreak of war, he ordered enforcement of the "scorched-earth" policy, encouraged civilian guerrilla fighting, and concluded a military alliance with Great Britain and with the Polish and Czechoslovak

governments-in-exile. Because of the advancing German armies, it was necessary in October, 1941, to transfer the center of government from Moscow to Kuibyshev on the lower Volga River. Two months later, however, with the removal of the German threat, Moscow resumed its normal function as capital. By early fall, the Germans had achieved one of their major objectives, the rich agricultural region of the Ukraine, but had failed to destroy the Russian armies. During 1942 and 1943, the tide of battle swayed back and forth. The ably led and well disciplined Russian armies aroused the admiration of military experts, particularly through their heroic defense of such key cities as Leningrad, Moscow, and Stalingrad. See WORLD WAR II.

Following Germany's attack, relations with the United States and Great Britain became much closer and stronger. Russia entered into a Lend-Lease agreement with the United States in October, 1941, and signed a twenty-year mutual assistance pact with Great Britain in June, 1942. In May, 1943, the Third International was dissolved, thus marking the end of a movement that since 1919 had sought to bring about world revolution.

A.P. and R.S.K.

Related Subjects. The reader is referred to:

CITIES		
Leningrad		Moscow
MOUNTAINS		
Caucasia		Ural Mountains
(Caucasus Mountains)		Valdai Hills
LAKES AND RIVERS		
Dnieper	Ladoga	Ural
Dniester	Neva	Vistula
Don	Onega	Volga
REPUBLICS, AUTONOMOUS REGIONS, ETC.		
Armenia	Crimea	Turkoman Soviet
Azerbaijan	Georgia	Socialist Republic
Circassians	Siberia	Ukraine
	Tadzhik	Uzbek
PRODUCTS AND INDUSTRIES		
Barley	Forests and	Manganese
Caviar	Forestry	Oil
Coal	Fur and	Platinum
Copper	Fur Trade	Rye
Fish	Gold	Sturgeon
Flax	Iron and Steel	Wheat
HISTORY		
Austerlitz		Poland (History)
Berlin, Congress of		Romanov
Crimea (Crimean War)		Russo-Japanese War
Holy Alliance		Russo-Turkish Wars
Nihilists and Nihilism		Vienna, Congress of
Northmen		World War I, II
BIOGRAPHY		
Alexander (I, II, III)		Nicholas (I, II)
Bonaparte, Napoleon		Peter I
Catharine (I, II)		Rasputin, Gregory
Ivan (III, IV)		Rykov, Alexis I.
Kerensky, Alexander		Stalin, Joseph
Kuropatkin, Alexei N.		Trotsky, Leon
Lenin, Nikolai		Voroshilov, Klimentz
Mazeppa, Ivan S.		Witte, Sergey Y.
UNCLASSIFIED		
Bolsheviks	Duma	Ruthenians
Cossacks	Kremlin	Soviet
Dalton School	Mongols	Steppes
Plan	Russian Literature	Zemstvo

RUSSIAN CHURCH, originally a division of the Greek Church (which see). After the revolution of 1917 and World War I, the Russian Church broke apart into divisions based on geographical areas. The Soviet limited maintenance of places of worship, forbade social service work, and generally restricted religious activities, but, when the Germans invaded Russia in 1941, the church leaders declared for a "patriotic war," and the restrictions were consequently lightened.

RUSSIAN LANGUAGE, the most prominent among the Slavonic languages. Its present form dates from about the sixteenth century, although manuscripts written in primitive Slavonic show Russian forms as early as the twelfth century. Modern Russian was fully developed by the nineteenth century. In 1917-1918 the Soviets simplified the orthography.

There are three principal dialects: *Great Russian*, which is the literary and official language; *Little Russian*, used in Southern Russia, properly called Ukrainian; and *White Russian*, which is used in Western Russia and shows Polish influences.

The language is highly inflected, in this respect being more like Latin and Greek than like the languages of Western Europe. There are six cases for nouns, three genders, three tenses, two sets of endings for adjectives, and two varieties of participles. Compounds and derivatives are freely used, and the order of words in a sentence is not fixed, as the form of a word shows its relation to others. Variations in accent are prevalent, and most of the consonants have both the "hard" and "soft" pronunciations. These characteristics make the language difficult for a foreigner to acquire, but afford a language of great flexibility and expressiveness.

A.P.

RUSSIAN LITERATURE. From a country which had its beginnings in the ninth century, it would be natural to expect an old, well-established literature; but not until the nineteenth century did a Russian literature appear which commanded world interest. During the early centuries, Russia's literatures was made up of folk tales and songs, carried by wandering singers from east to west, and by word of mouth from generation to generation. Some tales are Slavic; some, the *byliny*, are epic songs akin to the Scandinavian sagas; some show their Aryan origin, and others the influence of the East. All the early history—the Varangians, the first Princes, the Tatar invasion, the growth of the cities and of the nation—is to be traced in the vast store of folk literature. The *byliny*, which have been called "history set to music," have been of service in maintaining a unity of spoken language, and also a native music which today makes the works of the Russian composers, Rimsky-Korsakov, Borodin, Mussorgsky, appeal to the

nation because their music is based on the songs of the people.

Early Literature. From the tenth to the twelfth century, there were various centers of development, each of which had its *annals*, or records, crude attempts at writing history. The most complete and the best-known is the *Chronicle of Nestor* (sometimes called the *Chronicle of Kiev*). This chronicle and an epic poem, *The Campaign of Igor*, based on the march, in 1185, of Igor of Novgorod against the Polovtsi in Southeastern Russia, are the earliest contributions to recorded literature.

The medieval period saw the Tatar invasion and, later, the growth of Moscow as a powerful military state, supported by the Church. All life was guarded and regulated, the people were oppressed, and the age of exile and prison terror began. Folk songs were banned, and learning was restricted to the monasteries. Nothing remains from this period save a few ecclesiastical writings and the remarkable diary of an exiled priest, Avvakum. The story of his journey to Siberia and his return, in 1681, to be burned at the stake, was a real contribution to literature and history.

The Seventeenth and Eighteenth Centuries. This period serves as a prologue to the great age of Russian literature. During it, Peter the Great gave Russia an alphabet by which the spoken language could be written. Lomonosov, philosopher, chemist, geographer, the brightest literary figure of this age, laid the foundations of Russian grammar. The Russian theater was established, and the plays, although they were modeled upon the French, were Russian in setting. The poet Zhukovsky gave Russia translations of Greek, English, and German classics, and the historian Karamzin (1766-1826) first awakened Russian national consciousness and a lasting interest in the history of the nation. His *History of the Russian State* was so brilliantly written that the first edition of this eight-volume work (3,000 copies) sold in twenty-five days. By the end of the century, Russia, thanks to Peter the Great and Catharine II, had taken its place among the European nations, and the stage was ready for a truly Russian literature.

The National Period. The general nature of the literature of this period was formed by certain characteristics of the age. Under an absolute czarist rule, politics was banned, and literature assumed its functions as far as possible: literary schools replaced political parties. The Westerners wanted European methods, and the other school, Slavophiles, wanted a reformed, patriarchal czarist system. Later, these political tendencies gave way to Marxists, who thought the industrialization of Russia the only course and the workers the only salvation; and the Narodniki, who felt the peasant and the communal village life the proper social

ideal for Russia. Writers, like political agitators, suffered exile and imprisonment for their views. Literature, as the only refuge for thinkers, became a serious civic occupation. Its aim was too high for it to be used for amusement, which accounts for Russia's marked dearth of humorists in the nineteenth century.

Literature was a new field in Russia, and was, therefore, open to discovery from many angles. One writer saw the evils of serfdom, another the danger of the inert middle class, another the humanity of the peasant class, or the mysticism of the Russian soul. There was especial interest in the peasant, and a growing conviction that he was the real cornerstone of Russian life. Unaware of this, the muzhik was, as Moissaye Olgin says, "like a drop in a black sea under a heavy sky." But the writers watching him felt that some day "the black sea would begin to heave and rage and storm and break its chains"; hence their interest.

In this period, the first great figure is Pushkin, the founder of modern Russian literature. He is followed by a group of poets, Lermontov, Krylov, Nekrasov. With the advent of Gogol begins the period of the realistic novel, in which Russian literature reached its greatest height in the novels of Dostoevsky and Tolstoy. In the realistic novel there are certain outstanding features—character predominating over plot; the "slice of life" type of story; a subject chosen from contemporary life, and a definite ethical outlook. The Russian novel becomes a problem, usually a problem of conscience, rarely one of action. Along with the novel grew the drama, criticism, and philosophy, to make this the golden age of Russian literature.

To the Russians there are dozens of important writers; the outside world knows only the greatest, chiefly novelists. This condition, in general, is due to a lack of translations, especially of the critics and philosophers. The great writers of the era will be found in alphabetical order in these volumes. The following are other well-known authors of the period:

Goncharov, *gahn chah rawf'*, IVAN (1812-1891), a novelist famous for his *Oblomov*, which exposed indolence as the curse of the Russian middle class. "Oblomovism" came to mean fear of living, of working, of loving, lest peaceful existence be disturbed.

Griboyedov, *gre bah yeh' dase*, ALEXANDER (1795-1829), the author of the distinctive Russian comedy of the period, *Misfortune from Intelligence*.

Herzen, *hehr' sen*, ALEXANDER (1812-1870), writer of political articles, and of memoirs written in a style of unequalled beauty. His best works are *Whose Fault Is It?*, a novel; *From the Other Shore*, and *Past Facts and Thoughts*.

Krylov, *krih lawf'*, IVAN (1768-1847), translated the fables of La Fontaine into Russian, thus helping to establish it as the literary language. His own fables were typically Russian and very popular.

Lermontov, *lyehr' mohn tose*, MIKHAIL (1814-1841), wrote many beautiful poems which won him the title "poet of the Caucasus." His best works are an epic

poem, *Song about the Merchant Kalashnikov*, many lyrical poems, and a novel in prose, *The Hero of Our Own Times*.

Merezhkovsky, *meh resh kawf' ske*, DMITRI (1865-), novelist, critic, and poet, a religious mystic, best known for his historic trilogy, *The Death of the Gods* (the story of Julian the Apostate); *The Resurrection of the Gods* (the story of Leonardo da Vinci); and *The Antichrist* (the story of Peter the Great and his son).

Nekrasov, *nyeh krah' sose*, NIKOLAI (1821-1877), a poet, familiar to us for his *Who Can Be Happy and Free in Russia?* Some peasants fly off on a magic carpet to find a happy Russian; the poem tells of the different parts of Russia which they visit, and the stories, representative of all classes of society, which they hear on their quest.

Ostrovsky, *ahs trawf' ske*, ALEXANDER (1823-1886), the founder of the modern realistic comedy and drama. The two plays by which he is best known, and which are still played, are *The Storm* and *Poverty Is No Crime*.

Saltykov, *sahl teh kawf'*, MIKHAIL (1826-1889), a satirist who wrote under the name of NIKOLAI SHCHEDRIN. His most important works are *Provincial Sketches*, *History of a City* (a satirical history of Russia), and *The Family Golovlev*.

Sologub, *sol' o goop*, FEODOR (1863-), the pen name of FEODOR TETERNIKOV. *Lyrical Poems*, *The Little Demon* (his most popular novel), and *The Sweet-Scented Name* are the works generally known to English readers.

Tolstoy, *tol stoy'*, ALEXEI, Count (1817-1875), wrote both lyrical and satirical poetry, but is best known for a trilogy of plays, *Death of Ivan the Terrible*, *Tsar Feodor Ivanovich*, and *Tsar Boris*, which are part of the current Russian repertory.

The Modernist Period. Since the beginning of the century Russia has had three revolutions; the last one, of the Bolsheviks, established the Soviet Union with its socialistic regime. Naturally the literature reflects the unrest.

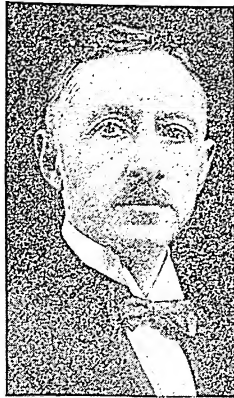
Until the Bolshevik revolution, the modern literature expressed the disillusionment after the first but unsuccessful revolution; it tended even toward despair, sometimes producing what can be called the pathological novel. In the first years of Bolshevism, literature was frankly subordinated to the task of propaganda. Even when the new order had become more stabilized, all writing, like all other activity, had to be closely related to the revolutionary program as outlined by the political leadership; the basis of Soviet literature was made that of "socialistic realism." Thus Feodor Gladkov wrote his two novels *Cement* and *Energy*, while Mikhail Sholokhov described rural conditions before and after the collectivization of agriculture, in *Quiet Flows the Don* and *Upland Earth*. *The Russian Primer* of M. Ilin had as its theme the Five Year Plan of socialistic industrialization. Other Soviet writers, some of whose works have been translated into English, are A. Serafimovich, Ilya Ehrenbourg, and the collaborators Il'f and Petrov, who took a lighter vein in *The Golden Calf*.

The following are the modernist writers best known to American readers:

Andreyev, *ahn dra' yef*, LEONID (1871-1919), a brilliantly original writer, neither realist nor romanticist, but a mystic whose philosophy was fatalism. *The Red Laugh* is a terrible protest against war; other stories are *The Seven Who Were Hanged*, *Sawa*, and *Judas Iscariot*. *Anathema* and *He Who Gets Slapped* are well-known plays.

Artsybashev, MIKHAIL (1878-1927), was best known for *Sanin*, a sensational anti-Christian novel which preaches personal happiness as the aim of life.

Bunin, IVAN ALEX-SIEEVICH (1870-), poet, short-story writer, and novelist. The son of a nobleman, he was born in Voronezh and spent his youth on his father's estates. At twenty-three, he won the Pushkin Prize for Poetry. After the Russian revolution in 1917, he lived in exile in France, where he produced some of his best work including *Mitya's Love* and *The Well of Days*. His best known short story is "The Gentleman from San Francisco." He received the 1933 Nobel prize for literature.



IVAN BUNIN

Chekhov, *chek' Kofo*, ANTON (1860-1904), equally famous as a writer of plays and short stories. His work was intellectual, subtle, and chiefly concerned with characters mentally or physically unhealthy. *Ward Number Six*, *The Seagull*, and *The Cherry Orchard* are from his pen.

Kuprin, ALEXANDER (1870-), a writer of stories and sketches alive with joy and activity. He is a direct literary descendant of Turgenev and Tolstoi. *The Duel*, *The Pit*, *A Bracelet of Garnets*, and *Stories for Children* are among his best works.

Savinkov, BORIS (1879-1925), a modern realist who wrote under the pen name, V. ROPSHIN. He represented, in *The Pale Horse* and *What Never Happened*, the school of writers disappointed in the revolution and impressed by the tragedies of warfare. S.N.H.

Related Subjects. The reader is referred in these volumes to the following articles:

Dostoevsky, Feodor M.	Pushkin, Alexander
Gogol, Nicholai V.	Russia (People; History)
Gorki, Maxim	Tolstoi, Lyoff N.
Kropotkin, Peter A.	Turgenev, Ivan S.

RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC, the official name of the largest state of the Union of Soviet Socialist Republics. See RUSSIA.

RUSSIAN THISTLE, or TUMBLEWEED. See THISTLE; TUMBLEWEED.

RUSSIAN TURKESTAN. See TURKOMAN SOVIET SOCIALIST REPUBLIC.

RUSSIAN WOLFHOUND. See GREY-HOUND.

RUSSO ANTICO, *rus' o an te' ko*. See WEDGWOOD WARE.

RUSSO-JAPANESE WAR, lasting from February, 1904, until September, 1905, established

Japan's position as a first-class power and its dominance in the Far East, and, sharpening the dissatisfaction of the Russian people with the czar's corrupt and inefficient government, brought on the Russian revolution of 1905.

Underlying Causes. In 1895 at the conclusion of the Chinese-Japanese War (which see), Japan won the island of Formosa and the peninsula of Liaotung. Russia, France, and Germany forced Japan to cede Liaotung back to China. During the next decade, Japan prepared for the inevitable struggle with Russia for supremacy in Eastern Asia.

Russia owned Siberia, had obtained possession of the island of Sakhalin (see ASIA map), and had built the Trans-Siberian Railroad (which see) joining Saint Petersburg (now Leningrad) with Vladivostok. After the close of the Chinese-Japanese War, Russia leased the Liaotung Peninsula from China and built a branch of the Trans-Siberian Railroad through Manchuria to Port Arthur. In 1900 control of Manchuria was obtained. A lack of harbors free from ice the year round was an obstacle to Russia's commercial expansion, and the government planned to extend its influence in Korea, a land of good harbors. Members of the imperial family and the nobility owned timber concessions along the Yalu River, for the sake of which they were incautious enough to provoke Japan.

The shore of Japan was almost within gunshot of the Korean coast, and Russia's occupation of it would place the island empire entirely at the former's mercy. In addition, Japan owned all of the railroads of Korea, and had tens of thousands of settlers there, as well as an enormous coast trade with that country. For more than five months the Japanese government carried on negotiations with Russia. The Japanese asked that the independence of Korea and Manchuria should be respected, and that both countries should be open to foreign settlement and trade. When negotiations proved futile, war was declared, on February 10, 1904.

Resources of Combatants. The Russian guards and patrols of the Manchurian railroads and the two garrisons of Vladivostok and Port Arthur numbered about 80,000 men. Japan had a trained army of 200,000 men. But behind Russia's army there were millions of men and limitless wealth; behind Japan's army there was also a second army of 200,000 men of the older classes, and nothing more. Russia's plan, therefore, was to avoid active engagements until reinforcements had come from the west; Japan's was to attack immediately.

Japan Opens Fire. On February 8, two days before the formal declaration of war, the Japanese fleet under Vice Admiral Togo swept down on the Russian Pacific squadron, drove it into the harbor at Port Arthur, laid mines in the entrance, and succeeded in blowing up two of

the largest of the Russian vessels which ventured forth. After this, Japan, while maintaining the blockade of the port, was able to land two armies, one in Korea and one on the Liaotung Peninsula. While one force, under Kuroki, engaged Kuropatkin's troops in the north, the other army, with Oku in command, prepared to attack Port Arthur.

The first land battle was fought along the Yalu, the river which divides Korea and Manchuria. It lasted for five days and resulted in a decisive victory for the Japanese. During the four months' campaign which followed, the Russians knew only one victory, the repulse of the Japanese at Tashichiao, in the west. Under its supreme commander Marshal Oyama, the Japanese army moved north in a great semicircle, forcing the Russians back and hemming them in, until at Liaoyang the campaign culminated in a furious battle, in which the Russians were forced to retreat to Mukden.

The Siege of Port Arthur. The first move of the southern army was to occupy Nanshan Hill on the narrowest part of the Liaotung Peninsula, a position of enormous strength. The siege of Port Arthur, which followed the capture of Nanshan, is one of the remarkable military achievements of modern times. The Russians, by intrenching themselves among the rocks and on the steep hillside, held out for two months before they were forced to withdraw inside the ring of forts surrounding the city. The Japanese, under Nogi, first attempted to take these fortifications by storm, but after seven days of fighting and bombarding, in which they lost 20,000 men, they realized the futility of this method of attack. In the five months following, they literally tunneled their way into the very heart of the fortress, advancing by means of trenches, by undermining outposts, and by blowing up fortifications. These engineering operations had to be followed up, in every case, by the fiercest kind of close fighting. Early in January, 1905, Stoessel, the Russian commander, surrendered the city.

The Last Battles. In the meantime, the second Japanese army, in the greatest land maneuver of modern times prior to the World War, forced the retreat of the Russian army under Kuropatkin toward the north. The Battle of Mukden, in March, 1905, for which Japan had to put forth a supreme effort, resulted in the complete rout of the Russian army. The Japanese navy, under Admiral Togo, was also proving its supremacy. In the Battle of the Sea of Japan, the Russian Port Arthur squadron was destroyed, and the Vladivostok squadron met with the same fate shortly afterward. On the 27th of May, the Baltic fleet was intercepted near Tsushima, on its way to Vladivostok, and was captured or sunk, only a very few ships making good their escape.

The Treaty of Portsmouth. The war drifted

on in a desultory fashion during the late spring and early summer, but both countries had had enough. Russia could import men at the rate of 30,000 a month over the Trans-Siberian Railway and reorganize its army, but its soldiers had no heart for further fighting, and a revolution broke out at home. Japan was exhausted, having paid a terrific price both in men and money for its victory. When Theodore Roosevelt, then President of the United States, proposed peace negotiations, both countries were ready to listen. By the terms of the treaty, which was signed at Portsmouth, N. H., on September 5, 1905, Russia ceded to Japan the southern half of Sakhalin, surrendered its lease of Port Arthur and adjacent territory, agreed to withdraw its troops from Manchuria, and to recognize Japan's sphere of influence in Korea.

RUSSO-TURKISH WARS. The many wars between Russia and Turkey cover a period of about 350 years, from the sixteenth century down to the World War, in which Turkey allied itself with Germany and Austria against Russia, England, France, Belgium, and Italy. The main cause for this period of struggle was Turkey's opposition to the eastward expansion of Russia into its territory. The antagonism inevitable between people of different religions—Christian Russians and Mohammedan Turks—was a contributory cause, and the border uprisings of the half-civilized, warlike tribes on the boundaries of both countries long furnished an excuse for invasion.

Early Wars. The first contest between Turkey and Russia lasted from 1569 to 1571. In an attempt to arrest the southern progress of Russia, the Turks planned to occupy Astrakhan, but the Russian army repulsed them with great loss, and won the first Turkish trophies. Though the Turks entered upon a retaliatory attack, and their vassals, the Crimean Tartars, sacked and burned Moscow in 1571, Russia dwelt on the wrongs of the Astrakhan invasion, and secured a favorable peace.

More than a century elapsed before the next encounter. Peter the Great, actuated by his ambition to make Russia a great naval power, attacked and captured Azov, in 1696, thus giving his empire a port with access to the Black Sea. In 1697 Charles XII ascended the throne of Sweden, and in 1700 he opened war against Denmark, Poland, and Russia. In 1709 the army of Charles was almost annihilated by Peter the Great. Subsequently, anxious to retrieve some of his losses suffered from this war, Charles incited the Turks to attack their mutual enemy, Russia. Moldavia, now a part of Rumania, eager to throw off the Turkish yoke, joined Russia, but proved to be a helpless ally. Russia was unsuccessful, and by the Treaty of Pruth, which followed, was obliged to give up Azov (1711).

The later wars of the eighteenth century were marked by daring exploits on the part of Suvorov, a celebrated Russian field marshal who won many spectacular victories over the Turks. In the war of 1736-1739, Austria was allied with Russia; by the Peace of Belgrade, Austria lost much territory, and Russia gained a little. In the next contest (1768-1774), Russia was also successful. Southern Russia was freed from Turkish power, and the Orthodox Christians in the sultan's dominions were placed under the protection of Russia, thereby offering a wedge for further aggression. By the war of 1787-1792, the boundaries of Russia were extended to the Dniester River.

Wars of the Nineteenth Century. There were four important wars during the nineteenth century. The first, lasting from 1806 to 1812, resulted in an extension of Russia's boundaries across the Dniester and on to the River Pruth, which gave it the province of Bessarabia. By the second, the war of 1828-1829, which ended with the Treaty of Adrianople, Russia forced Turkey to recognize the independence of Greece. The Dardanelles were opened to Russian merchant ships, and the provinces of Wallachia and Moldavia were made a protectorate of Russia. The third was the Crimean War (1854-1856), in which Turkey fought with England, France, and Sardinia against Russia, and got back a part of Bessarabia (see CRIMEA [Crimean War]).

The last war of the century is the one usually referred to as the Russo-Turkish War (1877-1878). Russia had never wavered in its determination to regain the territory and influence lost in the Crimean War, and in 1877 an excuse was found for attack in the massacres of the Christian peasants in Bulgaria. The war was fought by the Russians with great inefficiency and needless loss of life, but Russia won because the Turks were more inefficient.

The Treaty of San Stefano, which ended the war, was very favorable to Russia, but three months later, England, backed by the other European powers, intervened and succeeded in modifying the terms of the treaty. For details, see BERLIN, CONGRESS OF.

World War I. The final contest between the Turkish and Russian nations was a part of the great conflict that finally involved most of the countries of the world. The part each had in this greater struggle is related under the heading WORLD WAR I. As the result of this war, both monarchies became republics; these age-old enemies are now fast friends. Turkey was one of the first powers to recognize the Soviet government (1921), and in 1936 both Moscow and Ankara celebrated the fifteenth anniversary. See RUSSIA; TURKEY. A.P.

RUST, a brownish-red substance that forms on the surface of iron or steel when they are exposed to a damp atmosphere. The term

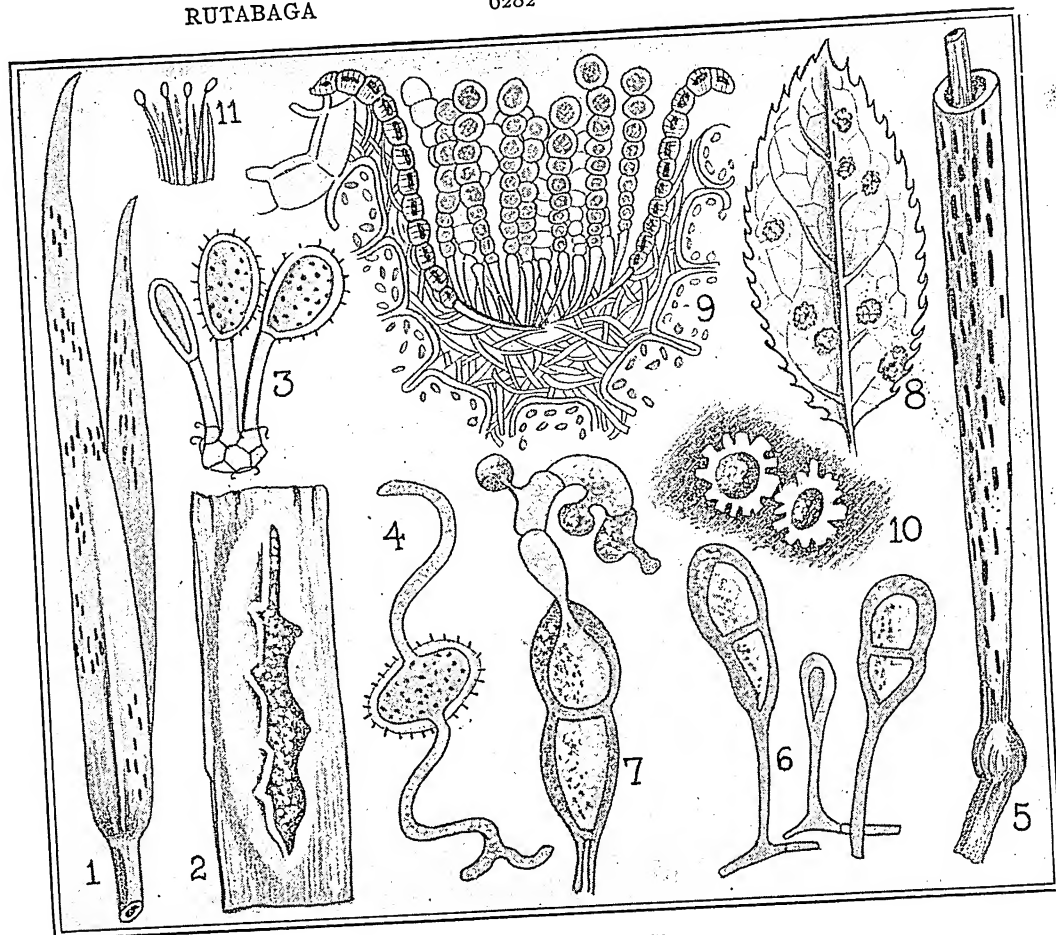
without modification means *iron rust*, which is a compound of oxygen and iron, commonly known as the red oxide of iron. Rust is formed by the union of the oxygen of the air with the iron, a process called *oxidation* (which see), and moisture is an important agent in producing the change. When rust is formed, the surface of the metal is corroded, so that a polished surface is made rough. Rust not only corrodes the surface, but it weakens the metal. Long exposure to air and moisture, for instance, will cause nails to rust off, and rust frequently eats holes through sheet iron. Articles of iron and steel should be kept in dry places, or their surfaces should be coated with some substance that will resist the action of oxygen. Polished tools may be easily protected if wiped over with a cloth soaked in oil. See OXYGEN. T.B.J.

How to Remove Rust. Rust may be removed from iron and steel by scrubbing with water, or by the use of the flour of emery or any other polishing powder, provided the rust has not been forming for too long a time. A thick coat of rust requires the use of an emery wheel, a grindstone, or a file for its removal. The brownish-yellow spots of iron rust formed on linen may be removed by soaking the fabric in a weak solution of oxalic acid (which see) for a short time, and then thoroughly washing it. A strong solution of this acid will weaken and may destroy the fabric. Sometimes lemon juice is used with success.

RUSTS, a large group of parasitic fungi occurring on seed plants and ferns. Rusts are especially injurious to cereal crops (see FUNGI). The name refers to the brownish spores produced by typical rusts, which somewhat resemble iron rust. Five different kinds of spores are borne by rusts, though not all are produced by every species. Each kind of spore represents a stage in the life history of the particular rust. One of the species that attacks wheat affords a good illustration of a typical rust.

This species is called the *black stem rust*. In the spring, small cuplike organs filled with spores appear on the lower side of the foliage of the common barberry. These spores are carried by the wind to wheat plants, and, entering the tissues, produce crops of reddish spores during the growing season. The new spores, in turn, are carried to other wheat plants, stunting their growth and withering the grain. At about harvest time, blackish, two-celled resting spores are produced on the stalks and stubble. These germinate in the spring, and their crop of sporidia attacks barberry plants. Thus a cycle is completed, and a new cycle begun. Manures are said to aggravate the disease. The damage to wheat resulting from this rust has caused the grain farmers of the United States and Canada losses amounting to millions of dollars.

Other harmful rusts include asparagus rust, blister rust of the white pine, cedar rust of



ILLUSTRATIONS OF RUST

(1). Leaves of wheat plant, with rust pustules, at one stage. (2) A group of spores. (3) Uredospores in various states of development. (4) Uredospores germinating. (5) Portion of culm of a wheat plant, showing dark streaks formed on the sheath of a leaf. (6) One form of rust in various stages of development, known as teleutospores. (7) A teleutospore that has germinated and produced a germlike tube bearing three secondary spores. (8) A barberry leaf bearing several clusters of rust. (9) Greatly magnified external protective covering enclosing numerous rust chains. (10) Two spores shown in 9, seen from above. (11) Sporules from a spermatogonium. [The above examples are nearly all magnified 300 to 400 times ordinary size.]

apples, and crown rust of oats. These and other rusts cannot be fought satisfactorily by spraying methods. In many wheat-growing regions, heavy loss has been prevented by eradication of the common barberry (see BARBERRY). Breeding and use of resistant varieties, rotation of crops, burning of infected straw and stubble, and adoption of rigid hygienic measures have all been found helpful. The United States Department of Agriculture will furnish detailed information on methods of control.

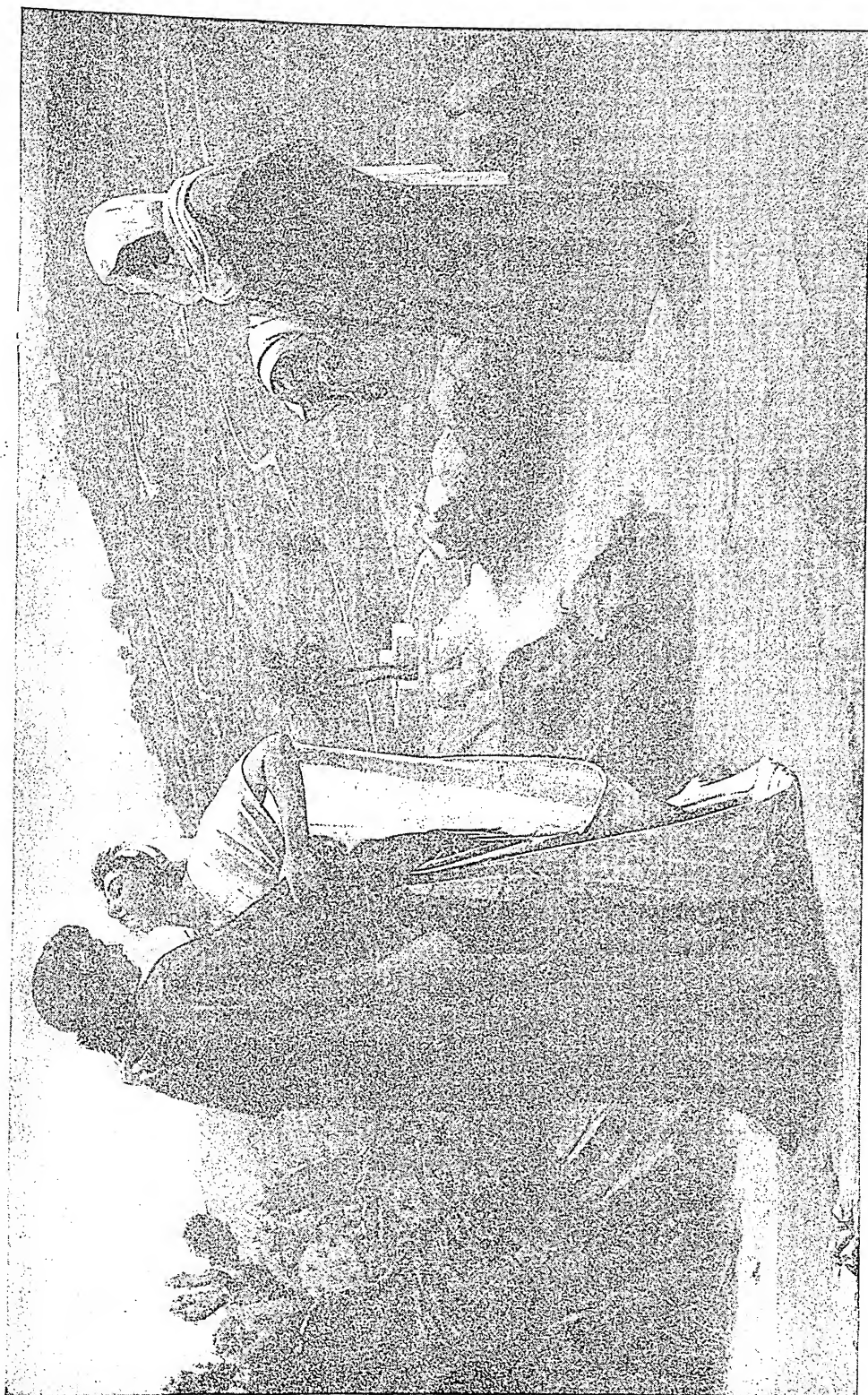
B.M.D.

RUTABAGA, *roo tah ba' gah*. See TURNIP.
RUTGERS UNIVERSITY. See NEW JERSEY (Education).

RUTH, *rooth*, a book of the Old Testament, of unknown authorship. It is an exquisite narrative of Hebrew rural life "at the time when the judges judged." Ruth is also the

name of the heroine of the story, one of the most beautiful ever written. She was a Moabitish damsel, the widow of an Israelite whose family had taken refuge from famine in Moab. Ruth's affection for Naomi, her husband's mother, and her loyalty to the family into which she had married are revealed in her answer to Naomi's plea that she return to her own home:

Entreat me not to leave thee,
Or to return from following after thee:
For whither thou goest, I will go;
And where thou lodgest, I will lodge:
Thy people shall be my people,
And thy God my God:
Where thou diest, will I die,
And there will I be buried:
The Lord do so to me, and more also,
If aught but death part thee and me.



Ruth and Naomi. The great dramatic incident in the Biblical story is feelingly portrayed. [Reproduction of a painting owned by the Corporation of Liverpool, England.] 6283

Then the two women journeyed to the land of Judah. Ruth's fine qualities came to the notice of Boaz, a landowner of Bethlehem, in whose fields she gleaned. As a kinsman of Naomi, he showed her many acts of courtesy and later made her his wife. Thus the alien maid became the great-grandmother of King David, and direct ancestress in the Messianic line.

RUTHENIANS, *ru the' nih anz*, or **RUSNIAKS**, *rus' nih aks*, one of the oldest of the Slav races, who now occupy vast territories in the southeast of Europe. They were called *Scythians* in ancient times; in the thirteenth century and during various later periods, they were called *Little Russians*, to distinguish them from the *Great Russians* of the Moscow region. They number about 40,000,000, and their home for many centuries has been in Galicia (which see), a province of former Poland, and in the Ukraine, an independent Soviet state. Many Ruthenians also live in Rumania, in the Carpatho-Ukraine, and especially in Bucovina, a former Rumanian province, now in Russia. Unlike the Poles, they are a peaceful and humble people, and remained peasants and laborers while the Polish ruled and mastered.

The Ruthenians speak the Russian language, for, though they have a Ruthenian tongue, campaigns of Russification have tended to suppress it. Most of them belong to the Greek Catholic (Uniate) Church, which acknowledges the Pope, while retaining the Slavonic liturgy. They have a deep nationalistic spirit, which has manifested itself throughout their history in attempts to organize an independent and united Ruthenian nation. But their passive and melancholy disposition, which developed through long years of suppression and domination, and the determination of the neighboring countries that they should not be united, left that aspiration unattained.

During the Tartar invasions, which drove the Little Russians westward, they came to be called Ruthenes, to obscure their Russian origin, and established themselves in Galicia about 1340. They were originally peasants, and when serfdom began in the northern countries, many of them fled to the borderland—the Ukraine. Consequently, *Ukrainians* and *South Russians* came to be other synonyms for *Ruthenians*. In the partition of Poland (1772 and 1793-1795), ethnological lines were disregarded. Russia took over all of the Ukraine except Eastern Galicia, which went to Poland, and part of Bucovina, which Austria received and was compelled to relinquish to Rumania following World War I. Russia began at once an active program of Russification, while Austria sought to placate the Ruthenians, to offset the Polish influence which had so long dominated them. Hope rose high among the Ruthenians when Austria granted them moral

and political rights, and the then Austrian city of Lemberg (Lwow) came to be the center of Ruthenian learning and national life. However, their vision of a united and independent Ruthenian state soon faded.

The Ruthenians were always handicapped by the illiteracy of their people, which was as high as 60 per cent, but they are rapidly becoming more literate. The competition between Austria and Russia for the favor of the Ruthenians was not entirely to the disadvantage of this dominated race; many of them became well-known poets and authors or rich landowners, and even the peasants manifested a greater desire for learning. It was said that many of the peasants who were unable to read or write studied in the libraries.

At the beginning of World War I, Russia occupied Galicia and did everything possible to bring the Ruthenians under Russian domination. Later, the czar's army was driven out by the Central Powers, which sought the support of the Poles by promising them a reunited country. The Ruthenians of Galicia became alarmed at the prospect of subjection to Poland, and during the chaos which followed the Austrian collapse, the Ruthenians set up a separate state and joined the Ukraine. Poland, however, refused to admit the national claims of the Ruthenians. Lemberg was taken on the ground that it was predominantly Polish, and in December, 1919, East Galicia was awarded to Poland for a term of years. Though the Ukraine emerged from the struggle as an autonomous republic in the Soviet Union, the long-cherished hope of a united Ruthenian nation was destroyed. World War II (which see) further disrupted national boundaries and brought the Ruthenian minorities under different sovereignty in German- and Russian-occupied Poland, and other territories taken by Hungary and Russia. See **RUSSIA**; **UKRAINE**. C.W.

RUTHENIUM. See **CHEMISTRY** (Elements).

RUTHERFORD, SIR ERNEST (1871-1937), British atomic physicist. He first demonstrated the structure of the atom and the smashing of atoms; and, consequently, the transmutation of elements.

RUTILE, *roo' til*, a beautiful reddish or yellowish-red mineral that sometimes occurs in transparent quartz, in the form of hairlike crystals. It imparts to the quartz the appearance of having colored threads extended through it. Rutile also occurs in larger masses in Norway, Quebec, Australia, and Virginia. It is employed for imparting a yellow color to glass and porcelain, and some of the finest specimens are polished and set. It is a source of titanium (which see). A.N.W.

Chemical Formula. Rutile is an oxide of titanium, with the formula TiO_2 ; that is, a molecule contains one atom of titanium and two atoms of oxygen.

RUTLAND, Vt. See **VERMONT** (map).



EXAMPLE OF RUYSDAEL'S ART

A landscape by the Dutch artist, now shown in the Pinakothek, Munich.

RUTLEDGE, *rut' lej*, JOHN (1739-1800), the first state governor of South Carolina and one of the great figures of Revolutionary days. He was born in Charleston, S. C., studied law in England, and began to practice in Charleston in 1761. From the very beginning of the trouble with England, he was an influential leader on the side of the colonies, and was one of the first to urge independence. He represented South Carolina in the Stamp Act Congress (1765) and again in the Continental Congresses in 1774-1777 and 1782-1783. Rutledge served as chairman on the committee which in 1776 drafted the constitution for South Carolina. He became the state's first executive, under the title of president of the state (1776-1778), and in the following year became governor.

It was largely through his foresight and patriotic ardor that Charleston was so fortified as to be able to repel the first British attack, in 1775. When the English captured the city, in 1780, after a two months' siege, Governor Rutledge joined the army of Nathanael Greene in North Carolina. At the close of the war, he was again sent to Congress, and was a member of the convention which framed the Constitution of the United States. He was successively Associate Justice of the United States Supreme Court, chief justice of the supreme court of South Carolina, and Chief Justice of the United States Supreme Court. In the latter capacity, he had presided over only one term when his

reason failed, and the Senate never confirmed his appointment. See SUPREME COURT OF THE UNITED STATES (Chief Justices).

RUWENZORI, *roo wen zo' re*, a South African range of mountains. See AFRICA (Surface).

RUYSDAEL, OR **RUISDAEL**, *rois' dahl*, JACOB (about 1628-1682), a foremost artist of the Dutch school of landscape painting. Hobbema (which see) alone approached him in this field. Though his canvases often give a suggestion of melancholy, because of his fondness for painting clouded skies, dark masses of leaves, and other somber aspects of nature, his pictures have a charm that comes from poetic and sympathetic treatment. In all of his work the technique is admirable, both in the rendering of detail and in the execution of broad effects, and he always depicted truthfully what he saw. He painted with equal facility quiet, flat landscapes, stormy seas, and mountainous scenery.

Ruysdael was born at Haarlem, where he had as a teacher his uncle, Salomon Ruysdael. His best work was accomplished in the period between 1660 and 1675, in the city of Amsterdam. The last years of his life were darkened by poverty and illness, and he died in an almshouse.

Representative Pictures. The best examples of his work include *View of Haarlem* and *Agitated Sea* (Berlin Museum); *Jewish Cemetery* (Dresden Gallery); *Landscape with Ruins* (National Gallery, Lon-

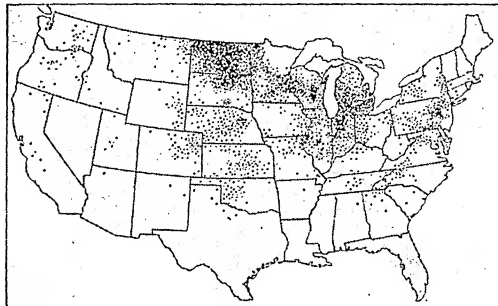
don); *Storm at Sea* (Louvre); and *The Windmill*. The Metropolitan Museum in New York possesses *Cottage under Trees*, *Forest Stream*, and *Wheatfields*, and there are many other Ruysdael canvases in private collections in America.

RUYTER, *roi' tur*, or *ri' tur*, MICHAEL ADRIAANSZON DE (1607-1676), a Dutch admiral who ranks with the greatest of Holland's fighting seamen. He was born at Flushing, and was a sailor from his boyhood. In 1641, having risen to the rank of rear admiral, Ruyter took charge of a squadron sent to help the Portuguese against the Spanish; a few years later he was successfully fighting against the Barbary pirates in the Mediterranean. In 1652, when Tromp won his great victory over Blake in the English Channel, he had Ruyter as his assistant. The latter was given chief command of the Dutch fleet after the death of Tromp, and though he was not always successful, he was a hard foe to conquer. He died in 1676 from the effects of wounds received in a battle with the French.

RYDAL MOUNT. See WORDSWORTH, WILLIAM.

RYE, a grain closely resembling wheat and barley, raised in the cool regions of Europe, Asia, and America. So far as men have been

adaptability to a cool climate and a light soil makes it one of the most important food plants of Northern Europe. The grain is sown broadcast, or in drills, like wheat, and from one and one-half to two bushels of seed per acre are



PRODUCTION IN THE UNITED STATES

Where the dots are most numerous on the map, the yield is greatest.

required. Under favorable conditions, the yield is from twenty to thirty bushels per acre. Fifty-six pounds is the legal weight of one bushel of rye in the United States.

Rye flour is obtained by a milling process similar to that used in the manufacture of wheat flour (see FLOUR). Three products—bran, shorts, and flour—are obtained. The flour is made into the black bread so generally eaten by the people of Northern Europe. It is more compact and a little less nutritious than wheat bread. Fuel value of rye bread is 1,620 calories per pound. In the United States, wheat and corn flour are mixed with rye flour in making rye bread, which is used to a limited extent.

Rye is used in the manufacture of malt and spirituous liquors, especially rye whisky. In Holland it is employed in the manufacture of Holland gin, and in Russia large quantities

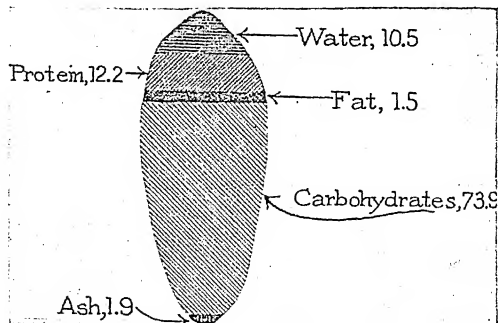


THE CHIEF RYE COUNTRIES

able to discover, rye is a comparatively recent development among the grains; no record of its use in ancient times has been found.

Rye is the hardiest of the cereals, and will succeed where other grains cannot be raised. It resembles wheat in structure and habits of growth. There are both winter and spring ryes. The winter rye is sown in the fall and harvested in June or early in July, and is hardy enough to stand the severe winter conditions of the Northern United States and Canada. The spring rye is raised chiefly for forage. There are a number of varieties of rye, some of which differ from others in hardness, as well as other characters. It is important, as with other grains, to plant the variety suited to the region in which it is to be grown. Winter rye is successfully grown in Alaska, where it is a valuable crop.

Rye is adapted to light, sandy soils and does not thrive well on heavy, damp soils. While it is not so valuable as wheat for food, its



COMPOSITION OF RYE

were formerly consumed in the production of kvass, a national beverage.

Rye is not used as a grain feed for stock as much as oats, corn, or barley. If fed exclusively, it causes digestive disturbances, and